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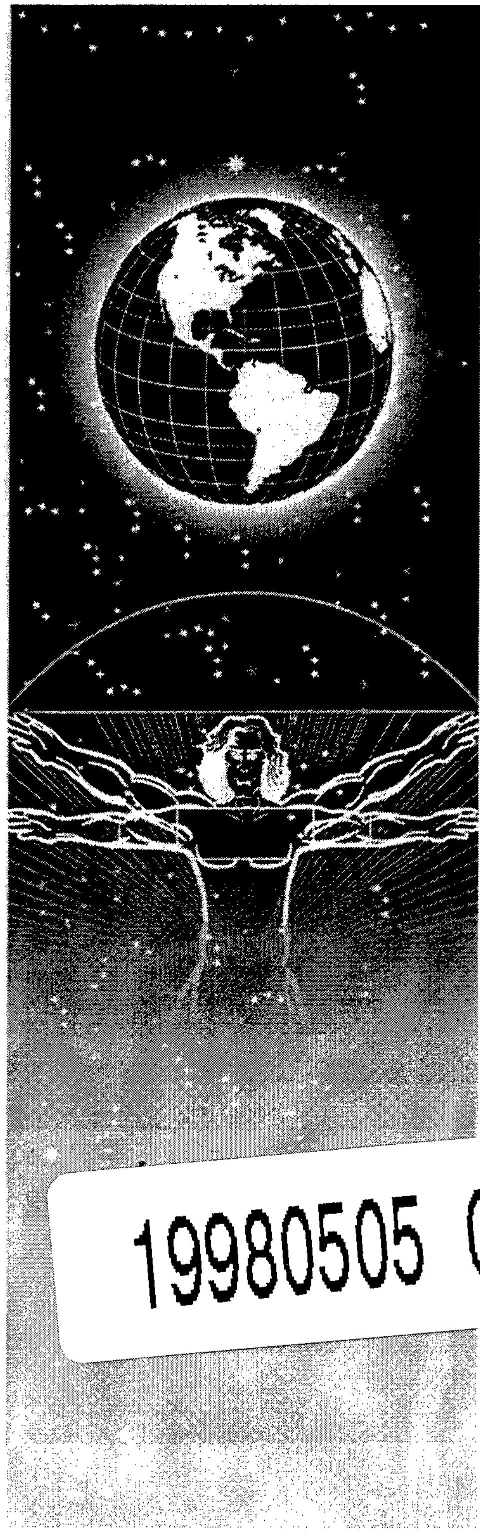

UNITED STATES AIR FORCE RESEARCH LABORATORY

INTERLABORATORY STUDY (ILS) OF THE STANDARD TEST METHOD FOR MEASURING THE NIGHT VISION GOGGLE-WEIGHTED TRANMISSIVITY OF TRANSPARENT PARTS

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This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER

HENDRICK W. RUCK, PhD
Chief, Crew System Interface Division
Air Force Research Laboratory

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13. ABSTRACT *(Maximum 200 words)*
Night vision goggles (NVGs) are now being used in aircraft and other applications (e.g., marine navigation, surveillance, vehicles) with increasing frequency. These devices amplify near-infrared (NIR) spectral energy. A transparency may have excellent visible transmissive characteristics but could have poor NIR transmissivity. Overall visual performance (acuity) can be degraded if the observer uses the NVGs while looking through a transparency that has attenuated transmissivity in the NIR region. ASTM P94-02, Standard Test Method for Measuring NVG-Weighted Transmissivity of Transparent Materials addresses this issue. This Interlaboratory Study (ILS) determined the precision of P94-02. The method describes both analytical and direct measurement techniques that determine the NVG-weighted transmissivity (T_{NVG}) of transparent pieces. T_{NVG} is the integrated value (450 through 950 nm) of the spectral transmissivity of a transparent part weighted (multiplied) by both the spectral sensitivity of a given set of NVGs and the light source, divided by the integrated value of the NVGs times the light source. The higher the T_{NVG} the more compatible a transparency is with NVGs, i.e., there is more light energy available to be amplified by the goggles which usually corresponds to better visual acuity performance of the observer (finer detail seen).

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1. TITLE
INTERLABORATORY STUDY (ILS) OF THE STANDARD TEST METHOD FOR MEASURING THE NIGHT VISION GOGGLE-WEIGHTED TRANSMISSIVITY OF TRANSPARENT PARTS

Committee F-7 on Aerospace and Aircraft Enclosures.
Subcommittee F-7.08 on Transparent Enclosures and Materials
RR: P94-02: XXXX

2. INTRODUCTION
There are several ASTM Standards that address light transmissivity through transparencies (ASTM Standards F 1316-90D and 1003-61) in the visible spectrum (400 through 700 nm). However, night vision goggles (NVGs) are now being used in aircraft and other applications (e.g., marine navigation, surveillance, personnel carriers) with increasing frequency. These devices amplify both visible and near-infrared (NIR) spectral energy. A transparency may have excellent visible transmissive characteristics but could have poor NIR transmissivity. Overall visual performance (acuity) can be degraded if the observer uses the NVGs while looking through a transparency that has attenuated transmissivity in the NIR region (Pinkus and Task, 1997, see Appendix A). ASTM P94-02, Standard Test Method for Measuring Night Vision Goggle-Weighted Transmissivity of Transparent Materials (see draft in Appendix B) addresses this issue. This ILS was undertaken in order to determine the precision of P94-02. The method describes both analytical and direct measurement techniques that determine the NVG-weighted transmissivity (T_{NVG}) of transparent pieces including ones that are large, curved, or held at the installed position. This ILS investigated just the analytical method since only one lab is presently capable of implementing the direct test method. T_{NVG} is the integrated value (450 through 950 nm) of the spectral transmissivity of a transparent part weighted (multiplied) by both the spectral sensitivity of a given set of NVGs and the light source, divided by the integrated value of the NVGs times the light source. The higher the T_{NVG} the more compatible a transparency is with NVGs, i.e., there is more light energy available to be amplified by the goggles which usually corresponds to better visual acuity performance of the observer (finer detail seen).

3. TEST PROGRAM INSTRUCTIONS AND TEST METHOD
The cover letter for test instructions to participating labs, follows.

SUBJECT: Interlaboratory Study for ASTM Standard P94-02: Standard Test Method for Measuring Night Vision Goggle-Weighted Transmissivity of Transparent Materials.

FROM: AL/CFHV
2255 H Street, Room 300
Wright-Patterson AFB OH 45433-7022

Dear Colleague,

Please find enclosed the instructions and materials needed by you to conduct spectral transmissivity measurements as discussed at the April 8th, 1997 ASTM Task Force committee meeting in St. Louis. The test has been simplified by the elimination of the Excel spread sheet. I am now simply supplying four (4) plastic samples. The spectral transmissivity scan data are then returned to me for completion of the data

analysis of which the details are described in the attached draft test method [P94-02, see Appendix B]. You may retain the draft for your use and records.

The data collection procedure is as follows:

(1) Please handle the samples carefully as to not cause any (further) damage.

(2) Do not clean them with any solvents. Use part specific, prescribed cleaning materials and methods.

(3) Spectral measurements are made from 450 nanometers (nm) through 950 nm in 5 nm incremental steps, with the arrow on top and pointed towards the specrtophotometer's sensor.

(4) Perform sample measurements sequentially, i.e., measure #1, #2, #3, #4.

(5) Repeat Step (4), five times, per instrument, yielding 20 sets of spectral data. Thus, the test sequence for the samples is:

Measure samples	[#1, #2, #3, #4]
Repeat	[#1, #2, #3, #4]
Repeat	[#1, #2, #3, #4]
Repeat	[#1, #2, #3, #4]
Repeat	[#1, #2, #3, #4]

(6) Repeat this process on more than one instrument, if available (instruments are statistically analyzed as "labs" and I need as many "labs" as possible).

(7) Label each spectral printout with:

Sample # and repetition #
Instrument make and model #
Date and time of the measurement

(8) These measurements can be made over a period of days, if desired. The variability in the data due to an extended measurement period will more accurately reflect real-world conditions (i.e., variability due to temperature, positioning, drift, etc.).

(9) Since these test samples need to be sent to several labs, please complete all measurements within two weeks of receipt and return data and samples to the address, above, so I can forward the samples to the next company.

Sincerely,

Alan Pinkus, PhD
Research Psychologist

6 Attachments:
1. Cover Letter
2. Plastic Sample #1
3. Plastic Sample #2
4. Plastic Sample #3
5. Plastic Sample #4
6. Draft Test Method P94-02

4. LIST OF PARTICIPATING LABORATORIES

There were six labs (instrument types).

Lab #1: EG&G Radoma GS1252 Spectraphotometer (15 May 1997)
Air Force Research Lab/HECV (formally Armstrong Lab/CFHV)
2255 H Street, Room 300
Wright-Patterson AFB OH 45433-7022
POC: Alan Pinkus (937-255-8767)

Lab #2: Cary 5G Spectraphotometer (16 Jun 1997)
Air Force Research Lab (formally Armstrong Lab/OEO)
8111 18th Street
Brooks AFB TX 78235-5215
POC: Dennis Maier (210 536-3709)

Lab #3: Perkin Elmer Lambda 9 Spectraphotometer (16 Jun 1997)
Air Force Research Lab (formally Armstrong Lab/OEO)
8111 18th Street
Brooks AFB TX 78235-5215
POC: Dennis Maier (210 536-3709)

Lab #4: Hitachi U-2000 (2 Jul 1997)
Polycast, Inc.
70 Carlisle Pl
Stamford CT 06902
POC: Kuang Tran (203-327-6010

Lab #5: Model 736 Radiometer (21 Jul 1997)
Texstar, Inc.
1170 108th Street
PO Box 534036
Grand Prairie TX 75053-4036
POC: Lance Teten (214-647-1366)

Lab #6: UV/VIS/NIR (8 Sep 1997)
Sierracin/Sylmar Corp.
12780 San Fernando Rd
Sylmar CA 91342
POC: John Raffo (818-362-6711)

5. DATA REPORTS

See Appendix C

6. STATISTICAL DATA SUMMARY

The four test stimuli were 2 inch square samples of transparent plastic material: #1, 0.875 inches thick acrylic, #2 laminated (F-111), #3 gold-coated (F-16) and #4, 3 mm acrylic. Samples #2 and #3 were cut from actual aircraft windscreens. The main source of error in the test method is due to the variability among spectraradiometric (spectraphotmetric) instruments not the T_{NVG} calculation.

Absolute radiometric calibration of the instrument is not essential since T_{NVG} is a ratio. In this ILS, the six instruments were treated as labs. The samples were measured using spectraradiometric instruments but the actual calculation of T_{NVG} (in accordance with test method P94-02) was performed later, prior to data analysis. T_{NVG} equals the integral with respect to wavelength, of the transparent part's spectral transmissivity [$P(\lambda)$] times the spectral energy distribution of the light source [$S(\lambda)$] times the NVG spectral sensitivity [$G(\lambda)$] divided by the integral with respect to wavelength, of the spectral energy distribution of the light source times the NVG spectral sensitivity. Since the specific spectral energy distribution of the light source in Equation 1 is typically not known for operational conditions (it depends on the spectral energy distribution of the illumination source on the scene and the spectral reflectivity of the various objects in the scene) the NVG-weighted transmission coefficient was calculated using $S(\lambda) = 1$ for all wavelengths. This simplifies the equation and typically does not significantly affect the results for the vast majority of broad-band reflectance distributions normally encountered. (Pinkus and Task, 1997; Equation 1 in Appendix A). Just the analytical method section of P94-02 was studied since only one lab (Air Force Research Lab/WPAFB/HECV, formally the Armstrong Lab) has the capability to perform the other, direct method. An ILS for the direct method may be performed at a later date. Tables 1 through 4 summarize the ILS results.

Tables 1 through 4. Results summary of four plastic samples (thick acrylic, laminated, gold-coated and 3 mm acrylic), measured by 6 labs (instruments) 5 times each: T_{NVG} means ($\overline{x}$), standard deviations *(s)*, cell deviations *(d)*, *h* and *k* statistics, grand mean *(GM)*, repeatability (S_r), standard deviation of cell averages ($S_{\overline{x}}$), as defined in ASTM Practice E 691.

Table 1

									1.92	1.75
#1 (THICK)	**REPS**									
LABS	**1**	**2**	**3**	**4**	**5**	$\overline{x}$	*s*	*d*	*h*	*k*
EG&G	0.895	0.888	0.897	0.899	0.877	0.891	0.009	-0.012	-0.987	0.846
CARY 5G	0.904	0.903	0.899	0.904	0.903	0.903	0.002	-0.001	-0.072	0.173
PERK/ELM L9	0.901	0.898	0.894	0.896	0.890	0.896	0.004	-0.008	-0.634	0.378
HIT U-2000	0.902	0.902	0.902	0.903	0.902	0.902	0.000	-0.001	-0.085	0.015
736 RADIOM.	0.936	0.924	0.926	0.921	0.926	0.927	0.006	0.023	1.897	0.532
UV/VIS/NIR	0.902	0.903	0.901	0.904	0.900	0.902	0.001	-0.001	-0.119	0.120

GM	$S_{\overline{x}}$	S_r	S_R
0.903	**0.012**	**0.011**	**0.015**
	95%=	**0.030**	**0.043**
		r	***R***

Table 2

#2 (LAM)	REPS									
LABS	**1**	**2**	**3**	**4**	**5**	$\overline{X}$	s	d	h	k
EG&G	0.853	0.850	0.861	0.859	0.860	0.857	0.005	-0.010	-0.816	0.432
CARY 5G	0.868	0.866	0.867	0.862	0.864	0.865	0.002	-0.001	-0.114	0.202
PERK/ELM L9	0.867	0.864	0.858	0.862	0.857	0.861	0.004	-0.006	-0.439	0.382
HIT U-2000	0.869	0.868	0.865	0.870	0.858	0.866	0.005	-0.001	-0.080	0.462
736 RADIOM.	0.897	0.897	0.881	0.888	0.895	0.892	0.007	0.025	**1.964**	0.646
UV/VIS/NIR	0.863	0.860	0.862	0.859	0.859	0.860	0.002	-0.006	-0.514	0.168

GM	$S\bar{x}$	S_r	S_R
0.867	**0.013**	**0.011**	**0.016**
	95%=	**0.030**	**0.044**
		r	***R***

Table 3

#3 (GOLD)	REPS									
LABS	**1**	**2**	**3**	**4**	**5**	$\overline{X}$	s	d	h	k
EG&G	0.533	0.539	0.540	0.541	0.527	0.536	0.006	-0.007	-0.844	0.789
CARY 5G	0.547	0.547	0.546	0.546	0.547	0.547	0.001	0.003	0.375	0.067
PERK/ELM L9	0.541	0.541	0.535	0.535	0.532	0.537	0.004	-0.006	-0.762	0.520
HIT U-2000	0.541	0.541	0.541	0.543	0.542	0.542	0.001	-0.002	-0.201	0.117
736 RADIOM.	0.561	0.557	0.563	0.550	0.564	0.559	0.006	0.016	1.834	0.777
UV/VIS/NIR	0.539	0.543	0.541	0.538	0.540	0.540	0.002	-0.003	-0.402	0.259

GM	$S\bar{x}$	S_r	S_R
0.543	**0.009**	**0.007**	**0.011**
	95%=	**0.021**	**0.030**
		r	***R***

Table 4

#4 (3mm)	REPS									
LABS	1	2	3	4	5	$\overline{X}$	*s*	*d*	*h*	*k*
EG&G	0.878	0.878	0.880	0.886	0.877	0.880	0.004	0.002	0.300	0.583
CARY 5G	0.879	0.881	0.879	0.878	0.877	0.879	0.001	0.001	0.096	0.218
PERK/ELM L9	0.878	0.875	0.871	0.873	0.865	0.872	0.005	-0.006	-0.869	0.781
HIT U-2000	0.881	0.876	0.879	0.879	0.881	0.879	0.002	0.001	0.181	0.313
736 RADIOM.	0.897	0.884	0.891	0.879	0.890	0.888	0.007	0.010	1.573	1.133
UV/VIS/NIR	0.869	0.872	0.870	0.869	0.870	0.870	0.001	-0.008	-1.280	0.209

GM	$S_{\overline{x}}$	S_r	S_R
0.878	**0.006**	**0.006**	**0.008**
	95%=	**0.017**	**0.023**
		r	*R*

The critical values of the *h* and *k* statistics, used to determine outliers (ASTM Practice E 691, Table 12, p. 14, where $p = 6$ and $n = 5$), are 1.92 and 1.75, respectively. Only one lab (Table 2, sample #2, 736 Radiometer) exceeded the critical *h* (bolded) at 1.964. The data were reexamined for typographical errors but none were found. The prescribed method was followed so the data were retained for final analysis. Table 5 summarizes the repeatability (S_r) and reproducibility (S_R) values and Table 6 summarizes the 95% repeatability *(r)* limits and the 95% reproducibility *(R)* limits for the individual samples as well as the means.

Table 5. Repeatability (S_r) and reproducibility (S_R) values in T_{NVG}, derived from the data sets in Appendix C.

	REPEATABILITY (S_r) WITHIN LABS	REPRODUCIBILITY (S_R) BETWEEN LABS
SAMPLE #1	0.011	0.015
SAMPLE #2	0.011	0.016
SAMPLE #3	0.007	0.011
SAMPLE #4	0.006	0.008
MEAN	**0.009**	**0.013**

Table 6. 95% repeatability *(r)* limits and 95% reproducibility *(R)* limits in T_{NVG}.

	95% *r* LIMITS WITHIN LABS	95% *R* LIMITS BETWEEN LABS
SAMPLE #1	0.030	0.043
SAMPLE #2	0.030	0.044
SAMPLE #3	0.021	0.030
SAMPLE #4	0.017	0.023
MEAN	**0.025**	**0.035**

S_r ranged from 0.006 to 0.011 T_{NVG}
S_R ranged from 0.008 to 0.016 T_{NVG}

r ranged from 0.017 to 0.030 T_{NVG}
R ranged from 0.023 to 0.044 T_{NVG}

Since the accuracy of the measurements should not and did not depend upon the type of the transparent material, it is logical to calculate a mean T_{NVG} of the 4 sample sizes to derive the composite precision values indicative of this method.

The composite (mean) repeatability (S_r) and reproducibility (S_R) values:

Mean $S_r = 0.009\ T_{NVG}$
Mean $S_R = 0.013\ T_{NVG}$

The composite (mean) 95% limits for repeatability *(r)* and 95% limits for reproducibility *(R)* values:

Mean $r = 0.025\ T_{NVG}$
Mean $R = 0.035\ T_{NVG}$

Note: The 95% limits were calculated using the formulae, below. Since the 95% limits are based on the difference between two test results, the $\sqrt{2}$ factor was incorporated into the calculation (ASTM Practice E 177; 27.3.3).

r = 95% repeatability limit (within laboratories)
S_r = repeatability standard deviation

$$r = 1.960*\sqrt{2}*S_r$$

R = 95% reproducibility limit (between laboratories)
S_R = reproducibility standard deviation

$$R = 1.960*\sqrt{2}*S_R$$

7. RESEARCH REPORT SUMMARY

Precision: An interlaboratory study was conducted to determine the precision of ASTM P94-02 (draft), Standard Test Method for Measuring Night Vision Goggle-Weighted Transmissivity of Transparent Materials. Six labs (instruments) were used to measure four plastic samples, five times each. Statistical analysis (ASTM Standard Practices E 691 and E 177) revealed that the method's mean repeatability *(S_r)* was 0.009 T_{NVG} and the mean reproducibility *(S_R)* was 0.013 T_{NVG}. The mean 95% limits for repeatability *(r)* was 0.025 T_{NVG} and the mean 95% limits for reproducibility *(R)* was 0.035 T_{NVG}.

Bias: The procedure in this test method has no bias because the NVG-weighted transmissivity is defined only in terms of the test method.

8. REFERENCES

F 1316-90 Standard Test Method for Measuring the Transmissivity of Transparent Parts. *Annual Book of ASTM Standards*, Vol. 08.01. Mar 1991.

D 1003-61 Standard Test Method for Haze and Luminous Transmittance of Transparent Parts. *Annual Book of ASTM Standards*, Vol. 15.09. Sep 1961.

Pinkus, A. and Task, H. L. (1997). The Effects of Aircraft Transparencies on Night Vision Goggle-Mediated Visual Acuity. *SAFE Symposium 1997*, Sep 8-10, pp. 93-104.

ASTM Standard Practice E 691. Conducting an Interlaboratory Study to Determine the Precision of a Test Method.

ASTM Standard Practice E 177. Use of the Terms Precision and Bias in ASTM Test Methods.

APPENDIX A. Pinkus, A. and Task, H. L. (1997). The Effects of Aircraft Transparencies on Night Vision Goggle-Mediated Visual Acuity. *SAFE Symposium 1997*, Sep 8-10, pp. 93-104.

THE EFFECTS OF AIRCRAFT TRANSPARENCIES ON NIGHTVISIONGOGGLE-MEDIATEDVISUALACUITY

Alan Pinkus, PhD and H. Lee Task, PhD
Armstrong Laboratory
Crew Systems Directorate
HumanEngineeringDivision
Wright-Patterson AFB OH

ABSTRACT

Night vision goggles (NVGs) are currently used in a wide variety of military aircraft that were not originally designed for NVGs. Likewise, the windscreens and canopies on these aircraft were not designed with NVGs in mind. Present day windscreens and canopies typically have one or more specialized coatings applied to them. These may be reasonably transparent for visible wavelengths but not so transparent for near infrared light to which the NVGs are sensitive. It was hypothesized that the major mechanism by which aircraft transparencies affect the operation of NVGs is through reduced light levels. This would mean that the key characteristic of interest for determining the effect of an aircraft transparency on the operation of the NVGs would be its transmission coefficient calculated using the spectral sensitivity of the NVGs. This hypothesis was tested by investigating visual acuity performance of trained observers viewing through NVGs for three levels of ambient illumination (1, 2 and 5 times starlight) and three levels of NVG-weighted windscreen transmissivities (58, 76 and 100%). In addition, two levels of contrast were included in the study (20 and 70% modulation contrast). Three trained observers determined the orientation of a Landolt C using a two-alternative, forced-choice step paradigm. A luminance-based model was developed to smoothly combine the effects of illumination level and transmission level for each contrast thus supporting the hypothesis. In addition, the results demonstrate the significant difference between individual observer's performance level and the increased difficulty (higher variability) of performance at lower contrast levels.

INTRODUCTION AND BACKGROUND

Night vision gogglesprovide observers with the ability to see very dimly illuminated nighttime scenes by amplifying ambient light from the red and near infrared spectral energy region (600 through 950 nm; see Fig. 1). Anything that reduces the light level getting to the NVGs will tend to reduce the

output luminance while at the same time decreasing the signal-to-noise ratio. This, in turn, tends to reduce the visual acuity of observers using the NVGs. These effects are most apparent at very low ambient light levels such as starlight illumination conditions. The basic hypothesis of this study is that it should not matter whether the light level is reduced by lowering the illumination level on the target area or by attenuating the light level getting to the NVGs by viewing through a transparency. This leads to the concept of equivalent illumination. For purposes of this study, equivalent illumination is the product of the actual illumination level and the transmission coefficient of the transparency through which one is viewing. As a specific example, the equivalent illumination for 2 times starlight actual illumination viewing through a 50% transmitting windscreen would be 1.0 starlight (2 times 0.5). This is the same equivalent illumination obtained for an actual illumination of 1 times starlight viewing through the NVGs with no intervening transparency (1 times 1.0). If the hypothesis is correct one would expect the visual acuity for these two conditions to be essentially the same (within the variability expected for human observations).

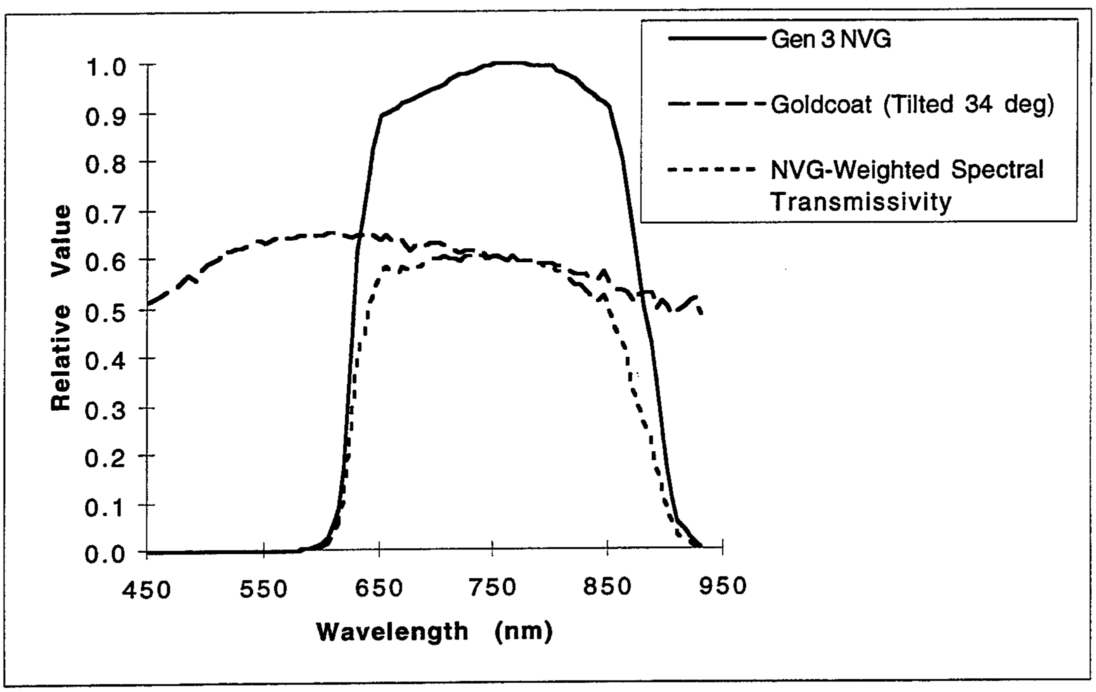

Figure 1. The relative value of a third-generation NVG, a gold-coated transparent sample (34 deg tilt) and its corresponding NVG-weighted spectral transmissivity plotted as a function of wavelength.

In order to determine how much an aircraft windscreen or canopy will reduce the light level by, it is necessary to measure or calculate the NVG-weighted transmission coefficient (T_{NVG}). This is done by using the spectral sensitivity of a given NVG[1,2,3]. Equation 1 describes the calculation for NVG-weighted transmissivity. T_{NVG} equals the integral with respect to wavelength, of the transparent part's spectral transmissivity [$P(\lambda)$] times the spectral energy distribution of the light source [$S(\lambda)$] times the NVG spectral sensitivity [$G(\lambda)$] divided by the integral with respect to wavelength, of the spectral energy distribution of the light source times the NVG spectral sensitivity. Since the specific spectral energy distribution of the light source in Equation 1 is typically not known for operational conditions (it depends on the spectral energy distribution of the illumination source on the scene and the spectral reflectivity of the various objects in the scene) the NVG-weighted transmission coefficient was calculated using $S(\lambda) = 1$ for all wavelengths. This simplifies the equation and typically does not significantly affect the results for the vast majority of broad-band reflectance distributions normally encountered. Figure 1 shows the spectral transmissivity curve for one of the gold-coated samples used in this study. The third-generation NVG sensitivity curve is plotted for reference.

$$T_{NVG} = \frac{\int_{450nm}^{950nm} P(\lambda)S(\lambda)G(\lambda)d\lambda}{\int_{450nm}^{950nm} S(\lambda)G(\lambda)d\lambda} \qquad (1)$$

where:

T_{NVG} = NVG-weighted transmissivity

$P(\lambda)$ = spectraradiometric scan through the transparent part

$S(\lambda)$ = spectral energy distribution of the light source (equal to 1 for our calculations)

$G(\lambda)$ = spectral sensitivity of the night vision goggle

Undocumented reports from some aircrew in different aircraft indicated that some transparencies, such as gold-coated F-16 canopies, may cause a reduction in NVG visual acuity compared to uncoated transparencies. Investigation into the NVG-weighted transmission level of currently fielded F-16 canopies revealed that there are at least three different gold coatings and two different indium-tin-oxide coatings in use. It was therefore the objective of this study to investigate the effect of coated transparent parts that included the full range of NVG-weighted transmission coefficients that might be found in the field. Since we could not obtain samples of all of the different types of coated windscreens it was decided to use what samples we did have in such a way as to provide a fairly wide range of transmissivities. Two gold-coated sections of transparencies were available: one with a

fairly light coating and one with a relatively heavy coating. In order to expand the range even further, viewing through the heavily-coated sample was done at a tilted angle which made the transmission coefficient even smaller.

METHOD

Participants
The three participants in this study were not naive subjects in the traditional sense but highly trained psychophysical observers, two males and one female, ranging in ages from 35 to 46 years.

Apparatus and Stimuli
The tests utilized a new set of ITT Model F4949D (serial #3873) NVGs[4] that had P-43 phosphor image intensifier tubes and a measured gain[5] of about 6000. With the room lights off and the NVGs on, the observer first adjusted the interpupilary distance of the goggles. Then they adjusted the eyepiece lenses by looking at the dark ceiling with the goggles and focusing until the scintillation looked sharp. Objective lenses were focused by viewing a one-half moon illuminated, NVG resolution chart composed of square-wave gratings[6].

All observations were made in a lighttight room. The observer sat in a chair behind a table with their eyes 9.14 m (30 ft) from the stimulus easel. On the table was a fixture that held an aircraft transparency sample and a foam board visual field mask which had a 15 cm high by 18 cm wide (6 by 7 in.) aperture. The observer held the NVGs but could rest his or her elbows on the table while looking through the hole and transparency at the stimulus. The goggles were powered using a regulated external power supply.

The stimuli were Landolt C's[7] printed using a high resolution photo-grade laser printer. All of the C's (in each set) were consecutively numbered 1 through n for ease of use with the computer program (see *Procedure* section) during the study. After the study, the observers' data were converted to Snellen equivalents. The high contrast (70% Michelson) set consisted of 69 C's ranging from 20/19.1 to 20/200.5 Snellen acuity for the 9.14 m viewing distance. C's 1 through 48 increased by about 2 minutes-of-arc (MOA) per step and C's 49 through 69 increased in about 2 to 4 MOA steps in order to insure a high upper range. The low contrast (20% Michelson) set consisted of 107 C's ranging from 20/19.1 to 20/236.8 Snellen acuity. For this set, C's 1 through 92 increased by about 2 MOA per step and C's 93 through 107 increased in about 2 to 4 MOA steps. The first stimulus presentation, as determined by the program, was always from the center of the set's range and all subsequent thresholds were found to be below this value.

The C's were mounted on 18 x 18 cm (7 x 7 in.) foam board. The letter and background were different gray levels, varied to achieve the two desired contrasts but maintain the same average reflectance. For presentation,

the C was placed onto a larger surround board 61 x 61 cm (24 x 24 in.) that matched either the high or low contrast Landolt C background reflectance as appropriate. The background board was held on an easel and had a small ledge that held the letter C in the center. The ledge was invisible when viewed through NVGs. The C was then easily placed onto the ledge with the gap oriented either up or down.

The experimenter's station was to the side of the stimulus easel. The computer's electroluminescent, backlighted liquid-crystal display was filtered and shrouded to eliminate any stray light from falling on the target pattern.

Three, precalibrated, 2856K incandescent lamps[8] were used to easily change to the different illumination levels. Apertures varied their intensity without affecting the color temperature. Illumination levels used were: 1x starlight = 3.4×10^{-4} lx (3.2×10^{-5} fc)[9]; 2x starlight = 6.7×10^{-4} lx (6.2×10^{-5} fc); 5x starlight = 1.8×10^{-3} lx (1.7×10^{-4} fc). A fourth lamp, set to about one-half moon illumination 1.3×10^{-1} lx (1.2×10^{-2} fc) was used to illuminate an NVG resolution target[6] during pretest goggle focusing.

Three transmission conditions were included in this study: a tilted heavily gold-coated sample, a non-tilted lightly coated sample, and no intervening transparency (100% transmission, hereafter termed baseline or high T_{NVG}). The T_{NVG} for the heavily gold-coated sample tilted to a 34 deg orientation was 58% (hereafter termed low T_{NVG}). The untilted (normal) lightly gold-coated sample had 76% transmissivity (hereafter termed medium T_{NVG}). This study used three different combinations of stimulus illumination, with three different levels of T_{NVG} coefficient to achieve nine total levels of equivalent illumination. Table 1 summarizes the nine equivalent illumination levels derived from the different illumination and T_{NVG} coefficient combinations.

Testing was conducted within randomized blocks of the lighting conditions because the observer had to adapt to that level before the test. First, an illumination source was randomly selected. Within that lighting level, the observer was tested with a randomized order of stimulus contrasts and transparency samples. Two levels of contrast (20 and 70%), three levels of illumination and three levels of T_{NVG} yielded nine experimental conditions for high contrast letters and nine experimental conditions for low contrast. The visual acuity through the NVGs for trained observers was measured as a function of these nine equivalent illumination levels.

Table 1. The nine different equivalent illumination levels produced by all combinations of the three levels of stimulus illumination and three levels of transparency T_{NVG} coefficients.

MULTIPLES OF STARLIGHT	LOW T_{NVG} coefficient $T_{NVG} = 58\%$	MEDIUM T_{NVG} coefficient $T_{NVG} = 76\%$	HIGH T_{NVG} coefficient $T_{NVG} = 100\%$
1x	0.58	0.76	1
2x	1.16	1.52	2
5x	2.9	3.8	5

Procedure

A portable computer executed a two-alternative, forced-choice Step Program adapted from Simpson[10]. The experimenter started the Step Program which asked for the initial setup parameters: Landolt C upper and lower stimulus identification numbers (1 through 69 for high contrast or 1 through 107 for low contrast), confidence level (95%), number to criterion (5), maximum total number of trials (50) and a data file name. Using a conservative 95% confidence level caused the program to require a few more trials before converging to threshold.

The proper stimulus surround was placed onto the easel, a 1x, 2x or 5x starlight lamp was energized and the transparency sample placed into the fixture. The observer then partially dark adapted to the goggle output luminance for about 10 minutes. The Step Program instructed the experimenter to place a given numbered (size) Landolt C in an up or down, randomized position. The stimulus was blocked from the observer's view by the experimenter during placement onto the easel. The experimenter asked the observer if he or she was ready, unblocked the stimulus for about 4 seconds, then blocked it again. The observer had to respond either "up" or "down". No feedback was ever given to the observer. The experimenter then removed the stimulus and entered the observer's response into the Step Program. Based on the response, the Step Program determined the next stimulus size and randomized its orientation. The procedure was repeated until criterion was reached or the maximum number of trials were met. All observers converged before reaching the maximum number of trials. This procedure averaged about 10 minutes per experimental condition with five minute rests after each condition and additional rest after completion of each lighting condition.

RESULTS

The study presented a total of 1015 stimuli to the three observers. Threshold criterion (5 correct responses at smallest, reliably seen gap size) was reached in 19 trials on the average, 10 being the fastest and 38 the slowest (see Fig. 2 for an example). Snellen acuity, which served as the dependent variable, was calculated from the viewing distance and the gap size of the Landolt C with the standard conversion that 20/20

Snellen acuity corresponds to a gap size of one minute of arc. Table 2 is a summary of the results for the high contrast Landolt C condition listing the Snellen acuity for each illumination/transparency combination for each trained observer and the average across observers. The equivalent illumination column is the fraction of starlight that was available to illuminate the target pattern after accounting for the transmission coefficient of the transparency. This value was calculated by multiplying the illumination level (1, 2, or 5 times starlight) by the transmission coefficient (0.58, 0.76, or 1.00) for each condition. Table 3 is a summary of the results for the low contrast condition.

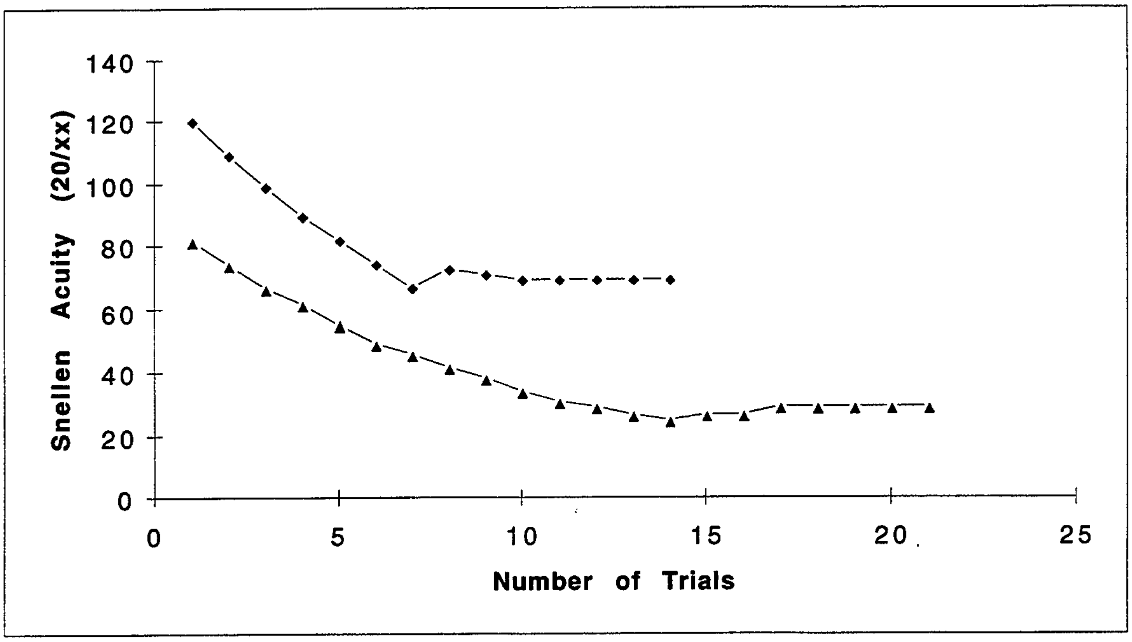

Figure 2. Typical Landolt C presentation sequences using the computer-based Step Program.

Table 2. Summary of high contrast (70%) stimuli data. All data are Snellen acuities (20/xx).

ILLUMINATION (X STARLIGHT)	T_{NVG} COEFFICIENT	EQUIV ILLUM	OBSERVER 1	OBSERVER 2	OBSERVER 3	MEAN
1x	LOW	0.58	66.8	63.0	61.1	63.6
1x	MEDIUM	0.76	61.1	59.2	49.7	56.7
1x	HIGH	1	53.5	51.6	47.7	50.9
2x	LOW	1.16	51.6	57.3	47.7	52.2
2x	MEDIUM	1.52	49.7	47.7	43.9	47.1
2x	HIGH	2	45.8	43.9	36.3	42.0
5x	LOW	2.9	36.3	40.1	36.3	37.6
5x	MEDIUM	3.8	36.3	32.5	34.4	34.4
5x	HIGH	5	36.3	32.5	34.4	34.4

Table 3. Summary of low contrast (20%) stimuli data. All data are Snellen acuities (20/xx).

ILLUMINATION (X STARLIGHT)	T_{NVG} COEFFICIENT	EQUIV ILLUM	OBSERVER 1	OBSERVER 2	OBSERVER 3	MEAN
1x	LOW	0.58	114.6	103.1	149.0	122.2
1x	MEDIUM	0.76	128.0	105.0	126.1	119.7
1x	HIGH	1	108.9	99.3	107.0	105.1
2x	LOW	1.16	114.6	84.0	122.2	106.9
2x	MEDIUM	1.52	112.7	108.9	82.1	101.2
2x	HIGH	2	105.0	99.3	70.7	91.7
5x	LOW	2.9	101.2	93.6	74.5	89.8
5x	MEDIUM	3.8	68.8	87.9	68.8	75.2
5x	HIGH	5	47.7	74.5	61.1	61.1

DISCUSSION

Although none of the combination of conditions (illumination and transmission coefficient) permitted a direct test of the equivalent illumination hypothesis, it was possible to graph the Snellen acuity results against the equivalent illumination to see if it would produce a reasonably smooth, monotonically decreasing curve. This is the type of curve that would be expected since, in general, visual acuity improves (Snellen acuity value is smaller) as light level to the eye increases[11]. Figures 3 and 4 show these graphs for the high contrast and low contrast conditions, respectively.

The graphs of Figures 3 and 4 include all of the individual observer data in addition to a dashed line that corresponds to the average for the three observers for each equivalent illumination condition. The high contrast graph of Figure 3 demonstrates a very clear pattern, although it is apparent that there is a certain amount of observer variability and differences between observers. Based on visual inspection of the graph in Figure 3, a curve fit was applied using a simple reciprocal model. The general form of the model equation was:

$$S = K + \frac{M}{E} \qquad (2)$$

where:

S = Snellen acuity (20/xx)

K = constant (empirically determined by least squares fit)

M = proportionality constant (empirically determined)

E = equivalent illumination

Table 4 is a summary of the model fit (Equation 2) for both the high contrast and low contrast Landolt C. The model is shown in Figures 3 and 4 as a solid line. The model fits reasonably well for the high contrast condition (r = 0.981) and not too badly for the low contrast condition (r = 0.912) given that human observations are involved. It should be noted that this fit was done for a relatively small range of illuminations (0.58 to 5.0 times starlight) and

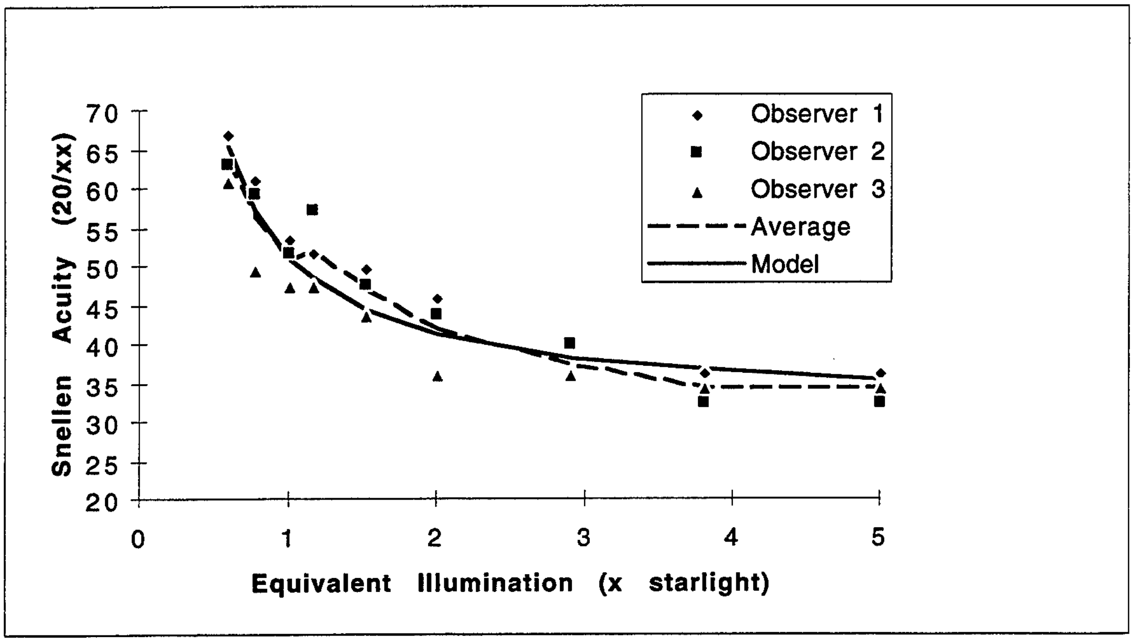

Figure 3. Plot of Snellen acuity as a function of starlight illumination for high contrast Landolt C stimuli (data from Table 2).

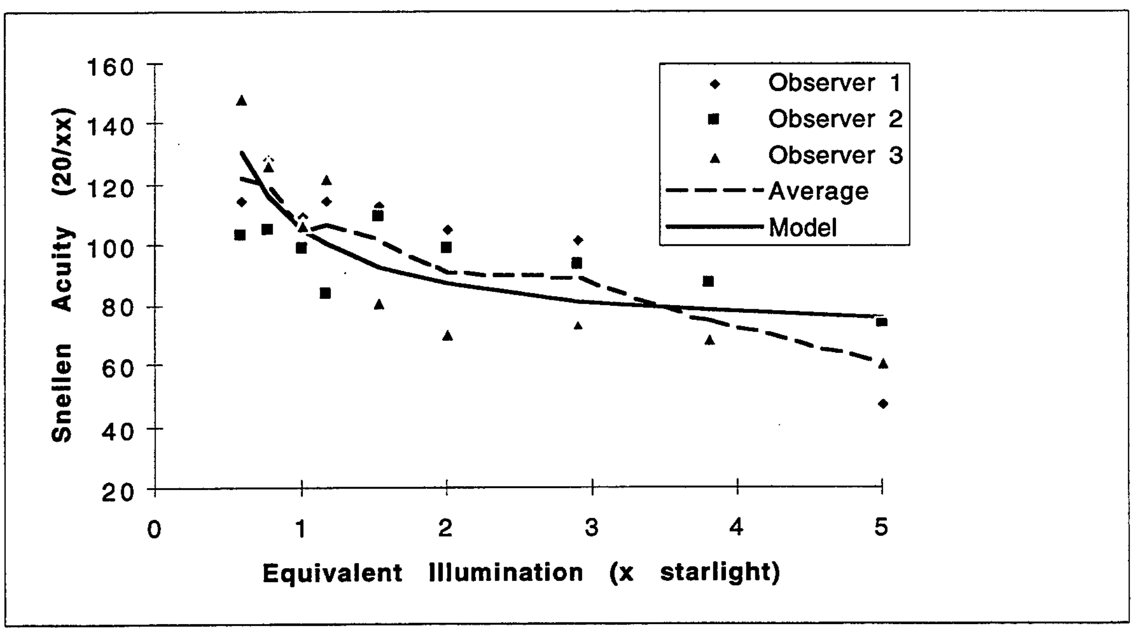

Figure 4. Plot of Snellen acuity as a function of starlight illumination for low contrast Landolt C stimuli (data from Table 3).

is therefore only valid for this range. It is possible the basic model (Equation 2) may still hold up for a greater range of illuminations but that has not yet been tested.

Table 4. Summary of model fit to data.

CONDITION	K	M	CORR (r)
70% CONTRAST	31.6	19.6	0.981
20% CONTRAST	70.0	35.3	0.912

The results shown in Figures 3 and 4 and the correlations in Table 4 support the validity of the hypothesis regarding using equivalent illumination and the T_{NVG} as a means of assessing the quality of aircraft transparencies with respect to NVGs. It is possible to use Equation 2 with the appropriate coefficients from Table 4 to reasonably predict the impact on visual acuity of a specific windscreen or canopy if its T_{NVG} value is known.

There is, however, an implicit assumption that must be addressed before applying the model presented herein. These results and the model presented assumes the transparency has a very low haze value[12]. Haze is a phenomenon caused by light scattering from materials within the transparency or from micro-scratches on the surface of the transparency (usually due to repeated cleaning). The effect of haze is to lower the contrast of objects viewed through the transparency which, in turn, would reduce visual performance (Snellen acuity). The implicit assumption was that the transparencies employed in this study had very little or no haze. The two transparencies used in this study were measured[13] and were found to have fairly low values of haze; 1.7% for the medium transmission and 2.4% for the low transmission transparency samples. If haze is present, then the model needs to be modified to include the loss in visual acuity due to contrast reduction. If haze is not present, then the contrast of objects viewed through a transparency remains the same no matter what the transmission coefficient is; only the apparent luminance of the object is affected. Future work in this area will address the haze issue.

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BIOGRAPHIES

ALAN PINKUS has been an Air Force psychologist since 1982. As a human factors engineer, he has worked on major systems including Royal Saudi Air Force KE-3 tanker, Gunship 2, LANTIRN, Air Force One and Joint-Stars. As a researcher, he has worked in the areas of image display metrics, night vision goggles, apparent motion, aircraft lighting,

transparency analysis, vision from space, workload assessment and has lectured for NATO AGARD in Europe. Alan has a BS Degree (Wright State, 1974), an MA (University of Dayton, 1980) and a PhD (Miami University, 1992), all in Experimental Psychology. He holds seven patents (or pending) in the area of night vision goggle ancillary devices and has over 20 publications. He is a member of the Human Factors and Ergonomics Society (Southern Ohio Chapter), SAFE, Association of Aviation Psychologists and is active in the American Society for Testing and Materials Subcommittee F7.08 on Aerospace Transparencies.

H. LEE TASK has been employed as a research scientist for the US Air Force since 1971. He has served as chief scientist for the Armstrong Aerospace Medical Research Laboratory (prior to its reorganization and disestablishment in 1991) and is presently a senior scientist at the Visual Display Systems Branch of the Human Engineering Division, in the Armstrong Laboratory's Crew Systems Directorate, at Wright-Patterson AFB, Ohio. He is currently involved in research and development in the areas of helmet-mounted displays, vision through night vision goggles, optical characteristics of aircraft windscreens, vision, and display systems. He has a BS Degree in Physics (Ohio University), MS degrees in Solid State Physics (Purdue, 1971), Optical Sciences (University of Arizona, 1978), and Management of Technology (MIT, 1985) and a PhD in Optical Sciences from the University of Arizona Optical Sciences Center (1978). During his career he has earned 36 patents and has published more than 75 journal articles, proceedings papers, technical reports, and other technical publications. He is a member of the Human Factors and Ergonomics Society (HFES), the American Society for Testing and Materials (where he is chairman of Subcommittee F7.08 on Aerospace Transparencies and is a Fellow of the Society), the Association of Aviation Psychologists, SAFE association, the Society for Information Display (SID), and SPIE (the optical engineering society). He has served as reviewer for papers in SAFE, SID, and HFES.

APPENDIX B. P94-02 Test Method

REVISED DRAFT (Dec 16, 97)

P94-02 Standard Test Method for Measuring the Night Vision Goggle-Weighted Transmissivity of Transparent Parts[1]

INTRODUCTION

Test Methods D 1003-61 and F 1316-90 (see Refs. 2.1.1 and 2.1.2) apply to the transmissivity measurement of transparent materials, the former being for small flat samples and the later for larger, curved pieces such as aircraft transparencies. Additionally, in D 1003-61, the transmissivity is measured perpendicular to the surface of test sample and both test methods measure only in the visible light spectral region. Night vision goggles (NVGs) are being used in aircraft and other applications (e.g., marine navigation, driving) with increasing frequency. These devices amplify both visible and near-infrared (NIR) spectral energy. Overall visual performance can be degraded if the observer uses the NVGs while looking through a transparency that has poor transmissivity in the NIR region. This method describes both direct and analytical measurement techniques that determine the NVG-weighted transmissivity of transparent pieces including ones that are large, curved, or held at the installed position.

1. Scope

1.1 This test method describes apparatuses and procedures that are suitable for measuring the NVG-weighted transmissivity of transparent parts including those which are large, thick, curved, or already installed. This test method is sensitive to transparencies that vary in transmissivity as a function of wavelength.

1.2 Since the transmissivity (or transmission coefficient) is a ratio of two radiance values, it has no units. The units of radiance recorded in the intermediate steps of this test method are not critical; any recognized units of radiance (e.g., watts/m^2-str) may be used, as long as it is consistent (see Ref. 2.2.1).

1.3 *This standard does not purport to address the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

2.1.1 D 1003-61 Standard Test Method for Haze and Luminous Transmittance of Transparent Parts. *Annual Book of ASTM Standards*, Vol. 15.09. Sep 1961.

2.1.2 F 1316-90 Standard Test Method for Measuring the Transmissivity of Transparent Parts. *Annual Book of ASTM Standards*, Vol. 08.01. Mar 1991.

2.2 *Published Documents:*

[1] This test method is under the jurisdiction of ASTM Committee F-7 on Aerospace and Aircraft and is the direct responsibility of Subcommittee F07.08 on Transparent Enclosures and Materials.

2.2.1 *RCA Electro-Optics Handbook.* (1974). Lanchaster PA: RCA|Solid State Division|Electro Optics and Devices. Technical Series EOH-11.

2.2.2 Wyszecki, Gunter. and Stiles, W. S. (1982). *Color Science: Concepts and Methods, Quantitative Data and Formulae* (Second Edition). New York: John Wiley and Sons.

3. Terminology

3.1 *Definitions*:

3.1.1 *Analytical test method* - the test method that uses spectral transmissivity data of a transparent part collected by the use of either spectraphotometric or spectraradiometric instrumentation. The data are then examined using analytic methods to determine the NVG-weighted transmissivity of the part .

3.1.2 *Direct test method* - the test method that uses the actual luminous output, as measured by a photometer, properly coupled to the eyepiece of the test NVG. The NVG-weighted transmissivity of the part is then determined by forming the ratio of the NVG output luminance with the transparent part in place to the luminance output without the part.

3.1.3. *NVG-weighted spectral transmissivity* - the spectral transmissivity of a transparent part multiplied by the spectral sensitivity of a given NVG (see Fig. 1).

3.1.4 *NVG-weighted transmissivity* (T_{NVG}) - the spectral transmissivity of a transparent part multiplied by the spectral sensitivity of a given NVG integrated with respect to wavelength (see Fig. 1, Equations 1 and 2).

3.1.5 *NVG spectral sensitivity* - the sensitivity of an NVG as a function of input wavelength.

3.1.6 *photometer* - a device that measures luminous intensity or brightness by converting (weighting) the radiant intensity of an object using the relative sensitivity of the human visual system as defined by the photopic curve. (see Refs. 2.2.1 and 2.2.2)

3.1.7 *Photopic curve* - the photopic curve is the spectral sensitivity of the human eye for daytime conditions as defined by the *Commission Internationale d'Eclairage (CIE)* 1931 standard observer (see Refs. 2.2.1 and 2.2.2).

3.1.8 *transmission coefficient* - same as *transmissivity.*

3.1.9 *transmissivity* - the transmissivity of a transparent medium is the ratio of the luminance of an object measured through the medium to the luminance of the same object measured directly.

4. Summary of Test Methods

4.1 *General Test Conditions:* The test can be performed in any light-controlled area (e.g., light-tight room, darkened hangar, or outside at night away from strong light sources). The ambient illumination must be very low due to the extreme sensitivity of the NVGs. A fixture holds the NVG and its objective lens is aimed at and focused on a target. The target can be either an evenly illuminated white, diffusely reflecting surface or a transilluminated screen (lightbox). The illumination is provided by a white, incandescent light source. Handle the samples carefully as to not cause any damage. Do not clean them with any solvents. Use part specific, prescribed cleaning materials and methods.

4.1.1 *Direct Test Method:* Attached directly to the eyepiece of the NVG is a photodetector. It has been found that the measured field of view (FOV) should be smaller than the uniformly illuminated portion of the target. The target illumination is adjusted so that the output of the NVGs is about 1.7 cd/m^2 (0.5 fL). This assures that the NVG input is not saturated; the automatic gain control (AGC) is not active. The luminance output of the NVG is measured and then repeated with the transparent material in place. The transmissivity is equal to the NVG output luminance with the transparent material in place divided by the NVG output luminance without the material (see Section 10.1, Equation 1). The result is the NVG-weighted transmissivity (T_{NVG}) of the transparent material.

4.1.2 *Analytical test method:* Without the sample in place, measure the light source's spectral energy distribution from 450 nanometers (nm) through 950 nm in 5 nm

incremental steps. Place the sample into the spectrophotometer or spectraradiometer fixture. Perform spectral measurements, also from 450 nm through 950 nm in 5 nm incremental steps. Obtain, from the NVG manufacturer, the spectral sensitivity of the goggle that will be used in conjunction with the part. Perform analytic method as defined in Section 10.2 by Equation 2, to derive the T_{NVG}.

5. Significance and Use

5.1 *Significance* - This test method provides a means to measure the compatibility of a given transparency through which NVGs are used at night to view outside, nighttime ambient illuminated natural scenes.

5.2 *Use* - This test method may be used on any transparent part including sample coupons. It is primarily intended for use on large, curved, or thick parts that may already be installed (e.g., windscreens on aircraft).

6. Apparatus:

6.1 *Test Environment* - This test method can be performed in any light-controlled area (e.g., light-tight room, darkened hangar, or outside at night away from strong light sources) since the NVGs are extremely sensitive to both visible and near infrared light. Extraneous light sources (e.g., exit signs, telephone pole lights, status indicator lights on equipment, etc.) can also interfere with the measurement.

6.2 *White Diffuse Target* - The white target can be any uniformly diffusely reflecting or translucent material (e.g., cloth; flat white painted surface; plastic). The target area should be either smaller (see Figure 2) or larger (see Figure 3) than the NVG FOV (35-60 degrees typical) in order to minimize potential alignment errors.

6.3 *Light Source* - The light source should be regulated to ensure that it does not change luminance during the reading period. It should be a low output, 2856 Kelvin incandescent light since this type emits sufficient energy in both visible and infrared without any sharp emission peaks or voids (see Ref. 2.2.1). Its output must be uniformly distributed over the measurement area of the white diffuse target. Use of neutral density filters or varying the lamp distance may be needed to achieve sufficiently low luminance levels to be obtained for test, since varying the radiator's output would shift its color temperature.

6.4 *Night Vision Goggles* - A family of passive image intensifying devices that utilize visible and near-infrared light and enable the user to see objects that are illuminated by full moonlight through starlight only conditions. The goggle that is used for test should be the same as that which will be used with the given transparent material (see Appendix B).

6.5 *Photometer* - Any calibrated photometer may be used for this measurement. However, the detector must be properly coupled to the NVG eyepiece and the FOV over which the light is integrated must be known (see Appendix A).

7. Test Specimen

7.1 If necessary, clean the part to be measured using the procedure prescribed for the specific material. Use of nonstandard cleaning methods can irrevocably damage the part. No special conditions other than cleaning are required.

8. Calibration and Standardization

8.1 It is not necessary that the photometer be calibrated in absolute luminance units since the measurement involves the division of two measured quantities yielding a dimensionless value. A generic photodector can be substituted for the photometer if its FOV is known .

9. Procedure

9.1 *General Procedures:* All measurements are performed in a darkened, light-controlled area. In order to control the effects of reflection, verify that there are no extraneous light sources that can produce reflections within the measurement area of the transparent material. To control the effects of haze, verify that no light other than the measurement light, falls on the area being tested.

9.2 *Direct test method:* This method allows analysis of large or small transparent parts placed at either normal (perpendicular to the optical axis) or installed orientations, such as an aircraft windscreen. Figure 2 illustrates the use of a small, transilluminated lightbox. Figure 3 depicts the use of a large, front-illuminated, white, diffusely reflective target, illuminated as uniformly as possible using a regulated white incandescent light source. The size of the target is dependent upon the test location, the obtainable luminance uniformity, and the FOV of the photodetector assembly. In the field, a transilluminated lightbox is probably the easiest to setup and use as it offers the advantage of compact, self-contained portability. It is important to maintain the same target to NVG distance during the measurements. In a light-tight room, a white, diffusely reflecting, front-illuminated surface may be utilized. In the field, the NVG can be held by hand and under laboratory conditions, can be mounted in a sturdy fixture. It is then aimed at and focused on the white target. The photodetector is attached to the NVG eyepiece. With the transparent material removed from the measurement path, the variable white light is adjusted to produce an NVG output luminance of about 1.7 cd/m^2 (0.5 fL). This insures that the NVG's input is not saturated; the AGC is not activated. Due to the extreme sensitivity of NVGs, neutral density filters may need to be placed in front of the light source in order to obtain low enough target luminance. After recording the NVG's output luminance, the transparent material is placed in the measurement path. If the material is a sample, its orientation relative to the measurement path can be simply perpendicular or at the installed angle. If an aircraft transparency is being tested, the NVG should be located at the design eye position relative to the transparency which is mounted in its installed position. Measuring at the installed angle is critical since many materials exhibit variations in transmissivity as a function of angle. The NVG's output, with the test piece in place, is then recorded. In order to prevent damage to the NVGs, verify that they are turned off before the test area lights are turned on.

There are numerous classes of NVGs (generations 2, 3; types A, B) that vary in their spectral sensitivity, intensified FOV, resolution, etc. It is important to select the proper NVG type that will be used in a given application. The NVG must also be in good working condition and meet minimum user performance specifications.

The target illumination source can be an incandescent operating at 2856 Kelvin which is the standard color temperature that is used for many NVG test procedures. The illumination from this source can be varied using neutral density filters since varying the light's voltage would cause a corresponding color temperature shift. If the NVG is to be used to view an area, through a specific transparent material, that is illuminated by a different kind of light source (e.g., mercury vapor; sodium) then that source must be properly noted in the test report.

The luminance output of the NVG is measured and then repeated with the transparent material in place. The transmissivity is equal to the NVG output luminance with the transparent material in place divided by the NVG output luminance without the material (see Section 10.1, Equation 1). The result is the NVG-weighted transmissivity (T_{NVG}) of the transparent material.

9.3 *Analytical test method:* If using a spectrophotometer, the sample is usually limited to about two by two inch sample coupons held in a normal position. In general (but depending on the model) a spectraradiometer can be used to measure large or small parts at normal or installed positions. With the sample removed, measure the light source's spectral energy distribution from 450 nanometers (nm) through 950 nm in 5 nm incremental steps. Place the sample into the spectrophotometer or spectraradiometer

fixture. Perform spectral measurements, also from 450 nm through 950 nm in 5 nm incremental steps. Obtain, from the NVG manufacturer, the spectral sensitivity of the goggle type (in 5 nm increments) that will be used in conjunction with the transparent part. Perform analytic method as defined in Section 10.2 by Equation 2, to derive the T_{NVG}.

10. T_{NVG} Calculation

10.1 *Direct test method calculation:* When using a photodetector attached to the NVG eyepiece, the calculation is described by Equation 1. The transmissivity is equal to the NVG output luminance with the transparent material in place (L_T) divided by the NVG output luminance without the material (L_B). The result is the NVG-weighted transmissivity (T_{NVG}) of the transparent material.

$$T_{NVG} = \frac{L_T}{L_B} \tag{1}$$

where:
T_{NVG} = NVG-weighted transmissivity
L_T = NVG output luminance with the transparent material in place
L_B = NVG output luminance without the transparent material

10.2 *Analytical test method:* Figure 1 is an example of the elements of the T_{NVG} calculation. When substituting a spectraradiometer (see Appendix A) for the NVG and photodetector assemblies (see Figures 2 and 3), the calculation is described by Equation 2. For Equation 2, T_{NVG} equals the integral with respect to wavelength, of the transparent part's spectral transmissivity [$P(\lambda)$] times the spectral energy distribution of the light source [$S(\lambda)$] times the NVG spectral sensitivity [$G(\lambda)$] divided by the integral with respect to wavelength, of the spectral energy distribution of the light source times the NVG spectral sensitivity.

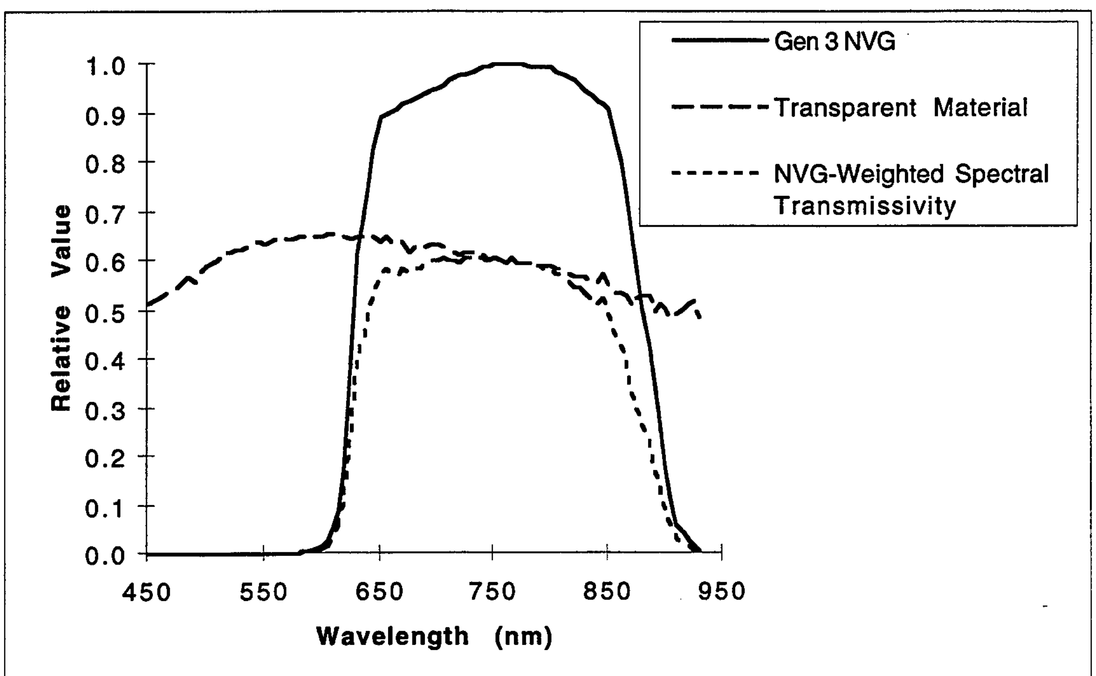

Figure 1. An example of how the spectral sensitivity of a Generation 3 NVG multiplied by the spectral transmissivity of a transparent part equals the NVG-weighted spectral transmissivity of that part. Integrating the curve with respect to wavelength yields the part's NVG-weighted transmissivity (T_{NVG}) value.

$$T_{NVG} = \frac{\int_{450}^{950} P(\lambda)S(\lambda)G(\lambda)d\lambda}{\int_{450}^{950} S(\lambda)G(\lambda)d\lambda} \qquad (2)$$

where:

T_{NVG} = NVG-weighted transmissivity
$P(\lambda)$ = spectraradiometric scan through transparent part
$S(\lambda)$ = spectral energy distribution of the light source
$G(\lambda)$ = spectral sensitivity of night vision goggle

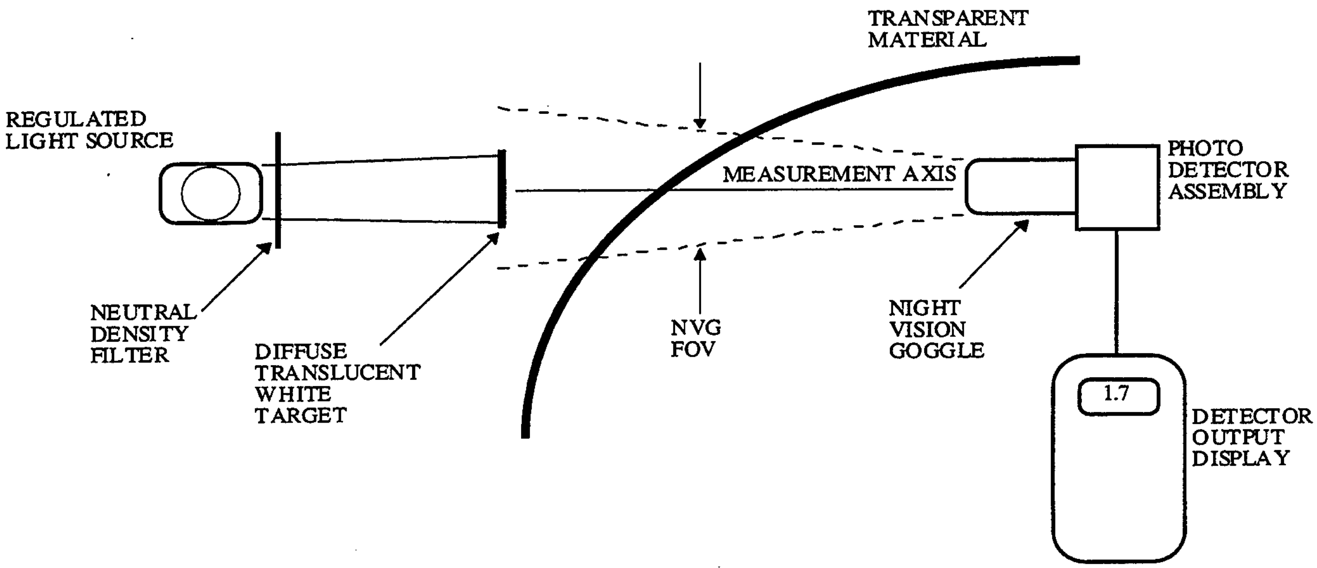

Figure 2. Direct test method equipment setup to measure the night vision goggle-weighted transmissivity of a transparent part using a transilluminated lightbox that underfills the NVG FOV.

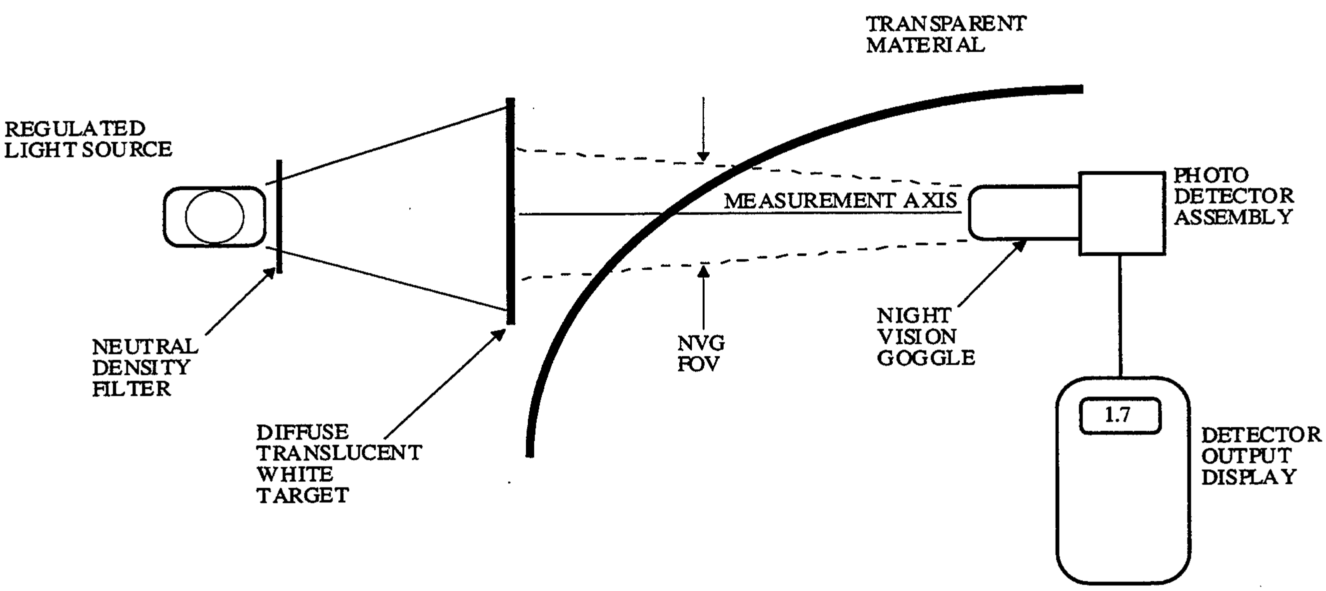

Figure 3. Direct test method equipment setup to measure the night vision goggle-weighted transmissivity of a transparent part using a transilluminated lightbox that overfills the NVG FOV.

11. Precision and Bias

11.1 An interlaboratory study (ASTM RR XXXX) was conducted to determine the precision of ASTM P94-02, Standard Test Method for Measuring Night Vision Goggle-Weighted Transmissivity of Transparent Materials. Six labs (instruments) were used to measure four plastic samples, five times each. The statistical summaries are shown in Tables 1 and 2.

Table 1. Repeatability *(S_r)* and reproducibility *(S_R)* values in T_{NVG}, derived from the data sets in Appendix C.

	REPEATABILITY (S_r) WITHIN LABS	**REPRODUCIBILITY (S_R) BETWEEN LABS**
SAMPLE #1	0.011	0.015
SAMPLE #2	0.011	0.016
SAMPLE #3	0.007	0.011
SAMPLE #4	0.006	0.008
MEAN	**0.009**	**0.013**

Table 2. 95% repeatability *(r)* limits and 95% reproducibility *(R)* limits in T_{NVG}.

	95% *r* LIMITS WITHIN LABS	**95% *R* LIMITS BETWEEN LABS**
SAMPLE #1	0.030	0.043
SAMPLE #2	0.030	0.044
SAMPLE #3	0.021	0.030
SAMPLE #4	0.017	0.023
MEAN	**0.025**	**0.035**

S_r ranged from 0.006 to 0.011 T_{NVG}
S_R ranged from 0.008 to 0.016 T_{NVG}

r ranged from 0.017 to 0.030 T_{NVG}
R ranged from 0.023 to 0.044 T_{NVG}

11.1.1 Since the accuracy of the measurements should not and did not depend upon the type of the transparent material, it is logical to calculate a mean T_{NVG} of the 4 sample sizes to derive the composite precision values indicative of this method. In summary, the statistical analysis (ASTM Standard Practices E 691 and E 177) revealed that the method's mean repeatability *(S_r)* was 0.009 T_{NVG} and the mean reproducibility *(S_R)* was 0.013 T_{NVG}. The mean 95% limits for repeatability *(r)* was 0.025 T_{NVG} and the mean 95% limits for reproducibility *(R)* was 0.035 T_{NVG}.

11.1.2 The 95% limits were calculated using the formulae, below. Since the 95% limits are based on the difference between two test results, the √2 factor was incorporated into the calculation (ASTM Practice E 177; 27.3.3). For r = 95% repeatability limit (within laboratories) and S_r = repeatability standard deviation.

$$r = 1.960 * \sqrt{2} * S_r$$

For R = 95% reproducibility limit (between laboratories) and S_R = reproducibility standard deviation.

$$R = 1.960 * \sqrt{2} * S_R$$

11.2 The procedure in this test method has no bias because the NVG-weighted transmissivity is defined only in terms of the test method.

12. Appendix A

12.1 Major suppliers of photometers:
International Light Inc., Newburyport MA
Labsphere, North Sutton NH
Minolta Corp.
Photo Research, Chatsworth CA

12.2 Major photometric light source manufacturers:
Acton Research Corp., Acton MA
DBA Systems Inc., Melbourne FL
Electro Optical Industries Inc., Santa Barbara CA
Graseby Infrared, Orlando FL
Hoffman Engineering Corp., Stamford CT
Labsphere Inc., North Sutton NH
Optronic Laboratories Inc., Orlando FL.
Oriel Corp., Strattford CT
Pyrometrics Corp., Millington NJ.

12.3 Major manufacturers of night vision goggles:
ITT, Roanoke VA
Litton, Phoenix AZ

APPENDIX C. Data reports: spectral transmissivity as a function of wavelength, 450 nm through 950 nm in 5 nm increments.

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.870	0.869	0.879	0.885	0.826
455	0.871	0.861	0.877	0.877	0.824
460	0.868	0.867	0.882	0.880	0.828
465	0.878	0.860	0.889	0.886	0.840
470	0.880	0.872	0.884	0.886	0.826
475	0.873	0.870	0.884	0.884	0.835
480	0.886	0.867	0.883	0.881	0.827
485	0.872	0.876	0.879	0.883	0.826
490	0.883	0.876	0.890	0.886	0.829
495	0.875	0.875	0.886	0.880	0.830
500	0.884	0.876	0.888	0.886	0.832
505	0.880	0.877	0.887	0.891	0.833
510	0.880	0.879	0.882	0.891	0.823
515	0.885	0.878	0.886	0.889	0.829
520	0.879	0.876	0.891	0.885	0.835
525	0.878	0.881	0.890	0.890	0.839
530	0.881	0.879	0.888	0.892	0.831
535	0.887	0.876	0.889	0.889	0.831
540	0.885	0.878	0.891	0.888	0.829
545	0.886	0.879	0.891	0.895	0.827
550	0.885	0.878	0.891	0.890	0.816
555	0.885	0.878	0.891	0.894	0.818
560	0.886	0.877	0.890	0.891	0.827
565	0.884	0.880	0.893	0.892	0.822
570	0.887	0.881	0.893	0.894	0.822
575	0.887	0.878	0.892	0.894	0.816
580	0.889	0.879	0.893	0.895	0.822
585	0.888	0.884	0.889	0.893	0.819
590	0.888	0.883	0.892	0.896	0.826
595	0.890	0.884	0.893	0.896	0.823
600	0.890	0.886	0.894	0.895	0.824
605	0.891	0.885	0.892	0.893	0.830
610	0.890	0.884	0.894	0.895	0.835
615	0.890	0.885	0.898	0.900	0.831

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.895	0.886	0.896	0.901	0.838
625	0.890	0.890	0.900	0.899	0.834
630	0.895	0.888	0.901	0.899	0.835
635	0.895	0.889	0.904	0.900	0.830
640	0.897	0.893	0.905	0.902	0.838
645	0.898	0.892	0.904	0.903	0.842
650	0.899	0.895	0.906	0.906	0.843
655	0.900	0.895	0.903	0.906	0.847
660	0.899	0.895	0.908	0.908	0.856
665	0.896	0.896	0.905	0.909	0.859
670	0.900	0.891	0.900	0.904	0.856
675	0.902	0.894	0.910	0.901	0.865
680	0.902	0.892	0.902	0.902	0.864
685	0.903	0.896	0.903	0.904	0.862
690	0.895	0.897	0.910	0.901	0.868
695	0.903	0.895	0.905	0.913	0.867
700	0.901	0.899	0.907	0.907	0.875
705	0.905	0.899	0.905	0.908	0.875
710	0.903	0.895	0.905	0.910	0.877
715	0.899	0.899	0.904	0.907	0.883
720	0.897	0.892	0.902	0.901	0.882
725	0.896	0.885	0.897	0.903	0.875
730	0.894	0.888	0.894	0.897	0.879
735	0.892	0.889	0.897	0.898	0.875
740	0.898	0.892	0.896	0.903	0.878
745	0.903	0.892	0.904	0.904	0.879
750	0.901	0.896	0.905	0.906	0.885
755	0.903	0.897	0.910	0.907	0.883
760	0.906	0.897	0.908	0.907	0.878
765	0.904	0.900	0.908	0.911	0.885
770	0.905	0.896	0.907	0.908	0.894
775	0.904	0.897	0.904	0.910	0.894
780	0.907	0.900	0.905	0.906	0.889
785	0.899	0.897	0.906	0.910	0.891

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.903	0.898	0.907	0.909	0.882
795	0.903	0.896	0.904	0.904	0.881
800	0.904	0.893	0.899	0.905	0.894
805	0.901	0.897	0.907	0.904	0.886
810	0.904	0.891	0.903	0.900	0.900
815	0.904	0.895	0.903	0.909	0.896
820	0.908	0.895	0.905	0.908	0.895
825	0.905	0.899	0.903	0.910	0.898
830	0.902	0.897	0.905	0.909	0.903
835	0.902	0.902	0.898	0.904	0.900
840	0.899	0.898	0.903	0.899	0.906
845	0.899	0.890	0.902	0.906	0.894
850	0.897	0.887	0.896	0.902	0.885
855	0.886	0.882	0.891	0.895	0.888
860	0.888	0.877	0.882	0.888	0.888
865	0.871	0.863	0.875	0.876	0.870
870	0.859	0.856	0.866	0.873	0.879
875	0.852	0.838	0.849	0.853	0.878
880	0.823	0.812	0.826	0.826	0.882
885	0.797	0.787	0.798	0.805	0.875
890	0.785	0.772	0.792	0.784	0.882
895	0.776	0.775	0.783	0.782	0.878
900	0.793	0.788	0.790	0.803	0.871
905	0.815	0.804	0.808	0.809	0.873
910	0.832	0.835	0.834	0.845	0.865
915	0.852	0.841	0.853	0.871	0.883
920	0.869	0.865	0.882	0.881	0.886
925	0.869	0.879	0.889	0.885	0.882
930	0.879	0.885	0.879	0.883	0.890
935	0.890	0.881	0.906	0.887	0.868
940	0.880	0.885	0.893	0.912	0.898
945	0.867	0.892	0.902	0.903	0.894
950	0.872	0.879	0.892	0.890	0.845

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.886	0.885	0.883	0.885	0.884
455	0.887	0.887	0.885	0.887	0.887
460	0.890	0.888	0.887	0.888	0.889
465	0.891	0.889	0.888	0.890	0.890
470	0.892	0.891	0.889	0.892	0.891
475	0.894	0.892	0.890	0.894	0.893
480	0.894	0.892	0.892	0.895	0.894
485	0.896	0.895	0.892	0.895	0.895
490	0.896	0.895	0.893	0.896	0.895
495	0.897	0.895	0.894	0.896	0.896
500	0.897	0.896	0.894	0.896	0.896
505	0.898	0.897	0.894	0.898	0.896
510	0.899	0.898	0.896	0.899	0.897
515	0.899	0.897	0.897	0.900	0.898
520	0.899	0.898	0.897	0.899	0.898
525	0.900	0.897	0.896	0.900	0.898
530	0.900	0.898	0.897	0.900	0.899
535	0.900	0.899	0.896	0.899	0.899
540	0.899	0.899	0.897	0.900	0.898
545	0.900	0.899	0.896	0.899	0.899
550	0.901	0.899	0.897	0.900	0.899
555	0.901	0.899	0.897	0.900	0.899
560	0.901	0.900	0.898	0.902	0.900
565	0.902	0.901	0.898	0.901	0.901
570	0.901	0.900	0.898	0.901	0.900
575	0.903	0.901	0.899	0.902	0.901
580	0.904	0.901	0.898	0.902	0.901
585	0.903	0.901	0.900	0.902	0.902
590	0.902	0.902	0.900	0.903	0.902
595	0.904	0.902	0.899	0.903	0.902
600	0.904	0.903	0.901	0.904	0.904
605	0.905	0.904	0.901	0.905	0.903
610	0.906	0.904	0.902	0.905	0.904
615	0.907	0.904	0.902	0.906	0.906

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.907	0.906	0.903	0.907	0.906
625	0.907	0.907	0.903	0.907	0.907
630	0.909	0.908	0.904	0.908	0.908
635	0.910	0.908	0.905	0.910	0.909
640	0.910	0.910	0.907	0.911	0.911
645	0.912	0.911	0.908	0.913	0.911
650	0.913	0.912	0.908	0.912	0.912
655	0.913	0.912	0.910	0.914	0.912
660	0.913	0.913	0.910	0.913	0.912
665	0.913	0.913	0.910	0.913	0.913
670	0.915	0.913	0.908	0.915	0.912
675	0.915	0.913	0.911	0.914	0.914
680	0.916	0.914	0.910	0.915	0.914
685	0.916	0.914	0.911	0.915	0.914
690	0.914	0.914	0.911	0.915	0.914
695	0.915	0.914	0.911	0.915	0.915
700	0.915	0.913	0.909	0.914	0.915
705	0.915	0.913	0.909	0.914	0.913
710	0.912	0.912	0.909	0.913	0.912
715	0.912	0.910	0.907	0.911	0.911
720	0.908	0.906	0.904	0.909	0.907
725	0.903	0.903	0.900	0.905	0.903
730	0.902	0.901	0.896	0.901	0.902
735	0.902	0.901	0.897	0.902	0.901
740	0.903	0.901	0.899	0.903	0.902
745	0.907	0.905	0.903	0.908	0.906
750	0.909	0.908	0.904	0.910	0.909
755	0.911	0.910	0.906	0.912	0.909
760	0.911	0.910	0.908	0.912	0.913
765	0.913	0.912	0.909	0.914	0.912
770	0.912	0.911	0.907	0.912	0.911
775	0.911	0.909	0.907	0.911	0.909
780	0.910	0.911	0.906	0.911	0.910
785	0.911	0.910	0.906	0.911	0.908

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.910	0.908	0.904	0.909	0.909
795	0.908	0.908	0.903	0.908	0.909
800	0.909	0.907	0.902	0.907	0.906
805	0.908	0.906	0.903	0.908	0.907
810	0.909	0.905	0.904	0.908	0.907
815	0.908	0.908	0.904	0.909	0.906
820	0.908	0.911	0.906	0.911	0.907
825	0.909	0.910	0.902	0.911	0.910
830	0.910	0.910	0.905	0.912	0.908
835	0.908	0.907	0.904	0.910	0.908
840	0.906	0.906	0.904	0.908	0.906
845	0.905	0.906	0.902	0.907	0.906
850	0.904	0.900	0.899	0.903	0.898
855	0.899	0.903	0.897	0.896	0.899
860	0.885	0.890	0.885	0.892	0.887
865	0.883	0.883	0.880	0.883	0.877
870	0.878	0.866	0.865	0.873	0.881
875	0.854	0.854	0.852	0.851	0.853
880	0.837	0.835	0.833	0.835	0.836
885	0.811	0.810	0.808	0.811	0.812
890	0.788	0.787	0.786	0.786	0.787
895	0.775	0.775	0.772	0.775	0.776
900	0.777	0.775	0.772	0.776	0.776
905	0.792	0.791	0.789	0.791	0.791
910	0.815	0.813	0.813	0.814	0.815
915	0.841	0.839	0.836	0.840	0.840
920	0.862	0.860	0.859	0.861	0.861
925	0.876	0.875	0.873	0.874	0.875
930	0.885	0.884	0.883	0.882	0.883
935	0.891	0.890	0.889	0.889	0.890
940	0.895	0.894	0.893	0.893	0.893
945	0.897	0.896	0.893	0.895	0.895
950	0.894	0.892	0.892	0.892	0.891

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.877	0.873	0.871	0.872	0.867
455	0.878	0.875	0.872	0.873	0.869
460	0.880	0.877	0.874	0.875	0.870
465	0.881	0.878	0.875	0.876	0.872
470	0.882	0.879	0.876	0.877	0.873
475	0.884	0.880	0.878	0.878	0.874
480	0.885	0.881	0.878	0.880	0.875
485	0.886	0.882	0.880	0.880	0.876
490	0.886	0.883	0.880	0.881	0.877
495	0.887	0.884	0.881	0.882	0.877
500	0.888	0.885	0.882	0.883	0.878
505	0.888	0.885	0.882	0.883	0.878
510	0.889	0.886	0.883	0.884	0.879
515	0.890	0.886	0.883	0.884	0.879
520	0.890	0.886	0.883	0.884	0.879
525	0.890	0.887	0.884	0.885	0.880
530	0.890	0.887	0.884	0.885	0.880
535	0.890	0.887	0.884	0.885	0.880
540	0.890	0.887	0.884	0.885	0.880
545	0.891	0.888	0.885	0.886	0.881
550	0.891	0.888	0.885	0.886	0.881
555	0.891	0.888	0.885	0.886	0.882
560	0.892	0.889	0.886	0.886	0.882
565	0.892	0.889	0.886	0.887	0.883
570	0.893	0.890	0.887	0.888	0.883
575	0.893	0.890	0.887	0.888	0.884
580	0.894	0.891	0.888	0.889	0.885
585	0.894	0.891	0.889	0.889	0.885
590	0.895	0.892	0.888	0.890	0.885
595	0.895	0.892	0.889	0.890	0.886
600	0.896	0.893	0.890	0.891	0.887
605	0.897	0.894	0.891	0.891	0.887
610	0.897	0.894	0.892	0.892	0.888
615	0.898	0.895	0.892	0.893	0.889

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.899	0.896	0.893	0.894	0.890
625	0.899	0.897	0.894	0.894	0.891
630	0.900	0.898	0.896	0.896	0.892
635	0.901	0.899	0.897	0.897	0.894
640	0.903	0.901	0.898	0.899	0.895
645	0.904	0.902	0.899	0.900	0.896
650	0.906	0.903	0.900	0.901	0.897
655	0.906	0.903	0.901	0.901	0.897
660	0.906	0.904	0.901	0.902	0.898
665	0.907	0.904	0.902	0.902	0.898
670	0.907	0.904	0.902	0.902	0.899
675	0.907	0.905	0.903	0.903	0.899
680	0.907	0.906	0.903	0.903	0.900
685	0.908	0.906	0.903	0.904	0.900
690	0.908	0.906	0.903	0.904	0.901
695	0.909	0.906	0.904	0.904	0.901
700	0.908	0.906	0.903	0.904	0.901
705	0.907	0.906	0.903	0.903	0.900
710	0.906	0.904	0.902	0.902	0.899
715	0.905	0.902	0.900	0.901	0.897
720	0.902	0.899	0.897	0.898	0.894
725	0.899	0.896	0.894	0.894	0.891
730	0.896	0.894	0.892	0.892	0.889
735	0.896	0.894	0.892	0.892	0.889
740	0.897	0.896	0.893	0.895	0.891
745	0.902	0.900	0.897	0.898	0.894
750	0.904	0.902	0.900	0.901	0.897
755	0.907	0.904	0.902	0.903	0.900
760	0.907	0.906	0.903	0.905	0.901
765	0.908	0.907	0.904	0.905	0.901
770	0.908	0.906	0.903	0.904	0.901
775	0.907	0.906	0.903	0.904	0.901
780	0.907	0.905	0.903	0.903	0.900
785	0.906	0.904	0.902	0.902	0.899

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.904	0.903	0.901	0.901	0.898
795	0.904	0.902	0.900	0.901	0.897
800	0.903	0.902	0.899	0.899	0.897
805	0.904	0.902	0.900	0.900	0.897
810	0.903	0.902	0.900	0.900	0.897
815	0.904	0.902	0.901	0.901	0.898
820	0.905	0.903	0.901	0.902	0.899
825	0.905	0.905	0.902	0.903	0.899
830	0.907	0.905	0.903	0.905	0.902
835	0.905	0.906	0.905	0.905	0.903
840	0.904	0.904	0.906	0.905	0.905
845	0.904	0.905	0.908	0.905	0.907
850	0.901	0.904	0.908	0.905	0.906
855	0.894	0.899	0.903	0.899	0.901
860	0.891	0.890	0.894	0.889	0.892
865	0.906	0.885	0.853	0.876	0.840
870	0.896	0.875	0.843	0.866	0.830
875	0.884	0.864	0.832	0.856	0.821
880	0.870	0.849	0.818	0.841	0.805
885	0.843	0.823	0.793	0.816	0.782
890	0.815	0.795	0.766	0.787	0.755
895	0.798	0.780	0.751	0.772	0.740
900	0.793	0.774	0.746	0.766	0.735
905	0.806	0.787	0.759	0.779	0.748
910	0.829	0.810	0.781	0.803	0.770
915	0.854	0.834	0.804	0.826	0.793
920	0.877	0.858	0.826	0.849	0.815
925	0.894	0.874	0.842	0.866	0.831
930	0.905	0.885	0.852	0.876	0.841
935	0.912	0.891	0.859	0.882	0.847
940	0.916	0.897	0.865	0.887	0.852
945	0.918	0.898	0.866	0.889	0.854
950	0.917	0.897	0.865	0.888	0.854

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.882	0.882	0.882	0.883	0.882
455	0.884	0.884	0.884	0.884	0.884
460	0.886	0.885	0.885	0.886	0.885
465	0.887	0.887	0.886	0.887	0.887
470	0.888	0.888	0.888	0.888	0.888
475	0.889	0.889	0.889	0.89	0.889
480	0.89	0.89	0.89	0.891	0.89
485	0.892	0.891	0.892	0.892	0.892
490	0.892	0.892	0.892	0.892	0.892
495	0.893	0.892	0.893	0.893	0.893
500	0.893	0.893	0.893	0.893	0.893
505	0.894	0.894	0.894	0.894	0.893
510	0.895	0.894	0.895	0.895	0.895
515	0.895	0.895	0.895	0.895	0.895
520	0.896	0.895	0.895	0.895	0.895
525	0.896	0.895	0.896	0.895	0.895
530	0.896	0.895	0.896	0.896	0.896
535	0.896	0.896	0.895	0.896	0.896
540	0.896	0.896	0.896	0.896	0.896
545	0.896	0.895	0.896	0.896	0.896
550	0.897	0.896	0.896	0.896	0.896
555	0.897	0.896	0.896	0.897	0.897
560	0.897	0.896	0.897	0.897	0.897
565	0.898	0.897	0.897	0.898	0.897
570	0.898	0.897	0.897	0.898	0.898
575	0.899	0.897	0.897	0.898	0.898
580	0.899	0.898	0.898	0.898	0.898
585	0.9	0.898	0.899	0.899	0.899
590	0.901	0.898	0.899	0.899	0.899
595	0.901	0.899	0.9	0.9	0.899
600	0.901	0.9	0.901	0.901	0.901
605	0.902	0.901	0.901	0.901	0.901
610	0.903	0.901	0.902	0.902	0.901
615	0.903	0.901	0.902	0.902	0.902

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.904	0.902	0.902	0.903	0.903
625	0.905	0.904	0.904	0.904	0.904
630	0.906	0.904	0.904	0.905	0.905
635	0.907	0.906	0.906	0.907	0.906
640	0.908	0.907	0.907	0.908	0.907
645	0.909	0.908	0.908	0.909	0.908
650	0.91	0.909	0.909	0.91	0.909
655	0.911	0.909	0.91	0.91	0.91
660	0.911	0.91	0.91	0.91	0.91
665	0.911	0.91	0.91	0.911	0.91
670	0.911	0.91	0.91	0.911	0.91
675	0.912	0.91	0.91	0.912	0.912
680	0.912	0.912	0.911	0.912	0.912
685	0.913	0.912	0.912	0.913	0.912
690	0.913	0.912	0.912	0.913	0.912
695	0.913	0.912	0.912	0.913	0.912
700	0.913	0.912	0.912	0.913	0.912
705	0.912	0.911	0.912	0.912	0.911
710	0.911	0.91	0.91	0.911	0.91
715	0.908	0.908	0.908	0.909	0.908
720	0.906	0.906	0.906	0.907	0.906
725	0.902	0.902	0.902	0.902	0.902
730	0.901	0.899	0.899	0.901	0.9
735	0.9	0.899	0.9	0.9	0.899
740	0.902	0.902	0.901	0.902	0.902
745	0.905	0.904	0.905	0.905	0.904
750	0.907	0.908	0.908	0.908	0.907
755	0.91	0.91	0.91	0.91	0.91
760	0.912	0.911	0.912	0.912	0.912
765	0.912	0.912	0.912	0.912	0.912
770	0.911	0.912	0.912	0.912	0.912
775	0.91	0.911	0.911	0.911	0.911
780	0.91	0.91	0.91	0.91	0.911
785	0.91	0.91	0.91	0.91	0.91

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.908	0.908	0.908	0.908	0.909
795	0.907	0.908	0.907	0.908	0.908
800	0.907	0.907	0.907	0.907	0.907
805	0.907	0.907	0.907	0.907	0.907
810	0.907	0.907	0.908	0.907	0.907
815	0.907	0.908	0.907	0.907	0.907
820	0.908	0.908	0.908	0.908	0.908
825	0.908	0.909	0.909	0.909	0.909
830	0.908	0.91	0.909	0.909	0.91
835	0.908	0.909	0.909	0.909	0.909
840	0.907	0.908	0.907	0.908	0.908
845	0.906	0.907	0.907	0.907	0.907
850	0.903	0.904	0.904	0.904	0.904
855	0.898	0.899	0.899	0.898	0.899
860	0.89	0.892	0.891	0.892	0.892
865	0.882	0.882	0.882	0.882	0.882
870	0.871	0.872	0.871	0.872	0.872
875	0.86	0.86	0.86	0.86	0.861
880	0.843	0.843	0.843	0.843	0.843
885	0.814	0.813	0.814	0.814	0.814
890	0.788	0.787	0.788	0.787	0.787
895	0.775	0.775	0.775	0.775	0.776
900	0.774	0.773	0.773	0.773	0.774
905	0.791	0.792	0.791	0.791	0.792
910	0.817	0.817	0.817	0.817	0.818
915	0.842	0.842	0.843	0.842	0.843
920	0.864	0.864	0.864	0.864	0.865
925	0.879	0.878	0.878	0.878	0.879
930	0.888	0.887	0.887	0.887	0.888
935	0.895	0.894	0.895	0.895	0.895
940	0.899	0.897	0.898	0.898	0.899
945	0.9	0.899	0.899	0.899	0.901
950	0.898	0.897	0.896	0.897	0.898

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR,INC.				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.910	0.901	0.909	0.907	0.921
455	0.914	0.906	0.913	0.912	0.937
460	0.927	0.918	0.925	0.925	0.936
465	0.922	0.914	0.920	0.922	0.933
470	0.923	0.916	0.919	0.919	0.937
475	0.924	0.915	0.921	0.920	0.937
480	0.927	0.913	0.922	0.922	0.936
485	0.927	0.915	0.924	0.922	0.936
490	0.928	0.915	0.921	0.921	0.935
495	0.927	0.915	0.921	0.920	0.937
500	0.929	0.916	0.922	0.921	0.939
505	0.927	0.915	0.922	0.918	0.937
510	0.930	0.916	0.924	0.920	0.938
515	0.931	0.916	0.926	0.921	0.937
520	0.932	0.916	0.927	0.921	0.939
525	0.928	0.916	0.923	0.919	0.935
530	0.930	0.916	0.923	0.919	0.936
535	0.929	0.915	0.921	0.917	0.933
540	0.930	0.913	0.918	0.918	0.933
545	0.928	0.913	0.920	0.917	0.932
550	0.931	0.913	0.922	0.918	0.935
555	0.930	0.915	0.921	0.916	0.932
560	0.929	0.915	0.921	0.917	0.933
565	0.930	0.915	0.922	0.918	0.933
570	0.930	0.913	0.920	0.917	0.933
575	0.932	0.915	0.919	0.917	0.933
580	0.932	0.914	0.920	0.916	0.934
585	0.932	0.913	0.920	0.915	0.932
590	0.932	0.914	0.919	0.915	0.933
595	0.933	0.916	0.921	0.916	0.935
600	0.932	0.916	0.921	0.917	0.932
605	0.932	0.916	0.920	0.917	0.932
610	0.931	0.916	0.921	0.914	0.932
615	0.934	0.919	0.926	0.918	0.935

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR,INC.				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.938	0.921	0.929	0.923	0.938
625	0.939	0.924	0.929	0.924	0.939
630	0.940	0.925	0.930	0.925	0.939
635	0.942	0.927	0.933	0.926	0.940
640	0.942	0.927	0.932	0.926	0.940
645	0.942	0.925	0.932	0.928	0.940
650	0.943	0.927	0.931	0.928	0.939
655	0.944	0.928	0.934	0.928	0.937
660	0.943	0.929	0.934	0.929	0.933
665	0.944	0.929	0.935	0.930	0.933
670	0.944	0.930	0.935	0.931	0.933
675	0.945	0.930	0.936	0.931	0.933
680	0.946	0.930	0.936	0.930	0.934
685	0.945	0.931	0.935	0.930	0.934
690	0.947	0.932	0.938	0.933	0.935
695	0.947	0.933	0.937	0.934	0.935
700	0.945	0.932	0.936	0.932	0.933
705	0.944	0.932	0.936	0.932	0.931
710	0.945	0.932	0.936	0.931	0.931
715	0.943	0.931	0.933	0.929	0.928
720	0.940	0.928	0.931	0.927	0.930
725	0.934	0.922	0.929	0.921	0.924
730	0.934	0.922	0.928	0.920	0.923
735	0.933	0.922	0.926	0.919	0.918
740	0.935	0.923	0.927	0.920	0.918
745	0.938	0.927	0.928	0.922	0.924
750	0.942	0.930	0.931	0.928	0.929
755	0.944	0.931	0.933	0.928	0.931
760	0.947	0.934	0.936	0.930	0.934
765	0.947	0.936	0.937	0.930	0.939
770	0.946	0.934	0.936	0.929	0.939
775	0.946	0.934	0.935	0.930	0.934
780	0.946	0.934	0.935	0.928	0.933
785	0.946	0.933	0.934	0.930	0.931

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR,INC.				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.943	0.931	0.933	0.928	0.931
795	0.942	0.931	0.933	0.927	0.931
800	0.944	0.932	0.934	0.927	0.932
805	0.942	0.932	0.933	0.927	0.932
810	0.941	0.933	0.933	0.926	0.933
815	0.942	0.931	0.932	0.927	0.933
820	0.943	0.934	0.934	0.929	0.934
825	0.945	0.935	0.935	0.929	0.936
830	0.945	0.934	0.934	0.930	0.934
835	0.942	0.930	0.931	0.926	0.932
840	0.942	0.930	0.932	0.928	0.933
845	0.941	0.930	0.930	0.925	0.931
850	0.935	0.925	0.927	0.921	0.928
855	0.930	0.920	0.919	0.915	0.922
860	0.922	0.911	0.909	0.906	0.912
865	0.912	0.901	0.901	0.895	0.903
870	0.901	0.890	0.889	0.885	0.892
875	0.890	0.879	0.878	0.873	0.881
880	0.868	0.859	0.859	0.854	0.861
885	0.840	0.831	0.831	0.826	0.833
890	0.817	0.806	0.806	0.801	0.808
895	0.802	0.793	0.789	0.788	0.794
900	0.802	0.793	0.790	0.787	0.795
905	0.820	0.810	0.805	0.803	0.808
910	0.848	0.836	0.831	0.829	0.837
915	0.872	0.861	0.855	0.855	0.861
920	0.894	0.884	0.878	0.877	0.887
925	0.909	0.899	0.893	0.892	0.902
930	0.919	0.909	0.903	0.903	0.911
935	0.924	0.914	0.909	0.908	0.917
940	0.926	0.917	0.912	0.912	0.919
945	0.929	0.920	0.916	0.916	0.922
950	0.927	0.917	0.914	0.913	0.919

	UV/VIS/NIR SPECTROPHOTOMETER -SIERRACIN/SYLMAR CORP.				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.879	0.880	0.878	0.880	0.877
455	0.881	0.882	0.880	0.882	0.879
460	0.883	0.882	0.881	0.884	0.881
465	0.885	0.885	0.884	0.886	0.882
470	0.885	0.886	0.885	0.887	0.883
475	0.886	0.886	0.886	0.888	0.885
480	0.888	0.889	0.887	0.890	0.886
485	0.890	0.890	0.888	0.890	0.888
490	0.896	0.891	0.888	0.891	0.888
495	0.890	0.891	0.890	0.892	0.889
500	0.891	0.892	0.890	0.893	0.889
505	0.892	0.892	0.891	0.893	0.890
510	0.892	0.892	0.891	0.893	0.890
515	0.892	0.893	0.892	0.895	0.891
520	0.894	0.894	0.893	0.894	0.892
525	0.894	0.895	0.893	0.895	0.892
530	0.894	0.894	0.893	0.896	0.891
535	0.894	0.895	0.894	0.895	0.892
540	0.893	0.894	0.893	0.895	0.892
545	0.894	0.895	0.893	0.895	0.892
550	0.894	0.895	0.892	0.896	0.893
555	0.895	0.895	0.893	0.896	0.893
560	0.896	0.895	0.894	0.897	0.894
565	0.895	0.895	0.895	0.896	0.894
570	0.896	0.896	0.895	0.897	0.894
575	0.897	0.896	0.895	0.898	0.894
580	0.898	0.898	0.896	0.898	0.895
585	0.897	0.898	0.896	0.898	0.896
590	0.897	0.898	0.896	0.898	0.896
595	0.898	0.898	0.897	0.899	0.897
600	0.898	0.898	0.897	0.899	0.898
605	0.899	0.899	0.898	0.900	0.899
610	0.899	0.901	0.899	0.901	0.899
615	0.901	0.902	0.900	0.902	0.899

	UV/VIS/NIR SPECTROPHOTOMETER -SIERRACIN/SYLMAR CORP.				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.901	0.901	0.900	0.902	0.900
625	0.902	0.901	0.900	0.904	0.901
630	0.903	0.904	0.902	0.904	0.902
635	0.905	0.904	0.904	0.906	0.904
640	0.906	0.907	0.905	0.906	0.905
645	0.907	0.907	0.906	0.908	0.905
650	0.908	0.908	0.907	0.908	0.907
655	0.909	0.909	0.907	0.909	0.907
660	0.908	0.910	0.908	0.910	0.908
665	0.910	0.909	0.908	0.910	0.908
670	0.909	0.909	0.908	0.910	0.908
675	0.910	0.910	0.909	0.911	0.908
680	0.910	0.910	0.909	0.910	0.909
685	0.911	0.910	0.909	0.911	0.909
690	0.911	0.912	0.910	0.912	0.911
695	0.911	0.912	0.911	0.913	0.910
700	0.911	0.912	0.911	0.912	0.910
705	0.910	0.911	0.910	0.912	0.909
710	0.910	0.909	0.908	0.910	0.908
715	0.908	0.908	0.907	0.909	0.907
720	0.905	0.905	0.903	0.906	0.903
725	0.901	0.901	0.900	0.902	0.900
730	0.900	0.899	0.897	0.900	0.898
735	0.899	0.899	0.898	0.900	0.897
740	0.901	0.902	0.900	0.903	0.900
745	0.904	0.904	0.904	0.905	0.903
750	0.906	0.906	0.906	0.908	0.905
755	0.909	0.908	0.908	0.911	0.908
760	0.909	0.910	0.909	0.911	0.909
765	0.911	0.912	0.910	0.914	0.911
770	0.912	0.912	0.911	0.913	0.910
775	0.911	0.909	0.908	0.912	0.910
780	0.909	0.910	0.908	0.911	0.908
785	0.908	0.910	0.907	0.911	0.908

	UV/VIS/NIR SPECTROPHOTOMETER -SIERRACIN/SYLMAR CORP.				
			SAMPLE 1		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.908	0.908	0.907	0.910	0.906
795	0.906	0.906	0.906	0.907	0.905
800	0.905	0.907	0.905	0.907	0.905
805	0.905	0.906	0.905	0.907	0.905
810	0.906	0.907	0.905	0.908	0.903
815	0.906	0.905	0.905	0.908	0.906
820	0.909	0.909	0.906	0.909	0.907
825	0.907	0.907	0.907	0.909	0.907
830	0.910	0.909	0.908	0.914	0.907
835	0.909	0.910	0.910	0.912	0.907
840	0.906	0.909	0.907	0.912	0.906
845	0.905	0.908	0.902	0.906	0.908
850	0.905	0.904	0.906	0.907	0.902
855	0.893	0.900	0.894	0.900	0.898
860	0.888	0.890	0.883	0.893	0.889
865	0.888	0.895	0.897	0.899	0.885
870	0.880	0.884	0.885	0.890	0.874
875	0.868	0.864	0.866	0.865	0.862
880	0.849	0.850	0.854	0.853	0.844
885	0.820	0.828	0.822	0.825	0.814
890	0.791	0.798	0.794	0.799	0.789
895	0.777	0.785	0.782	0.786	0.780
900	0.776	0.786	0.786	0.788	0.781
905	0.810	0.807	0.809	0.809	0.798
910	0.821	0.828	0.830	0.835	0.825
915	0.841	0.852	0.853	0.855	0.852
920	0.877	0.876	0.880	0.882	0.870
925	0.886	0.899	0.892	0.896	0.884
930	0.892	0.888	0.894	0.896	0.894
935	0.908	0.905	0.910	0.913	0.901
940	0.910	0.916	0.914	0.915	0.901
945	0.902	0.907	0.901	0.905	0.903
950	0.907	0.910	0.914	0.915	0.901

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.783	0.778	0.799	0.802	0.790
455	0.783	0.779	0.796	0.788	0.796
460	0.783	0.780	0.799	0.802	0.792
465	0.790	0.789	0.806	0.801	0.798
470	0.793	0.795	0.801	0.803	0.806
475	0.795	0.790	0.800	0.792	0.796
480	0.793	0.785	0.803	0.805	0.809
485	0.797	0.795	0.805	0.804	0.802
490	0.794	0.798	0.805	0.806	0.802
495	0.789	0.800	0.805	0.803	0.804
500	0.797	0.800	0.810	0.807	0.810
505	0.794	0.796	0.808	0.809	0.809
510	0.801	0.801	0.808	0.809	0.816
515	0.800	0.798	0.811	0.811	0.809
520	0.797	0.803	0.812	0.807	0.814
525	0.797	0.801	0.811	0.814	0.811
530	0.799	0.802	0.814	0.814	0.806
535	0.806	0.803	0.814	0.813	0.810
540	0.805	0.802	0.814	0.810	0.816
545	0.804	0.797	0.814	0.810	0.819
550	0.804	0.800	0.810	0.809	0.818
555	0.804	0.801	0.809	0.811	0.810
560	0.805	0.803	0.812	0.812	0.812
565	0.805	0.806	0.813	0.812	0.806
570	0.806	0.804	0.814	0.816	0.822
575	0.805	0.801	0.818	0.815	0.813
580	0.803	0.804	0.819	0.814	0.817
585	0.809	0.810	0.816	0.819	0.815
590	0.809	0.813	0.819	0.818	0.817
595	0.814	0.812	0.820	0.822	0.821
600	0.812	0.813	0.819	0.817	0.825
605	0.813	0.814	0.820	0.819	0.821
610	0.814	0.817	0.821	0.823	0.824
615	0.816	0.818	0.830	0.828	0.824

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.823	0.823	0.834	0.832	0.826
625	0.826	0.824	0.839	0.833	0.832
630	0.829	0.826	0.838	0.833	0.833
635	0.830	0.832	0.841	0.840	0.834
640	0.834	0.830	0.843	0.842	0.845
645	0.834	0.834	0.844	0.845	0.842
650	0.837	0.835	0.849	0.846	0.844
655	0.840	0.839	0.853	0.851	0.844
660	0.844	0.841	0.853	0.855	0.847
665	0.846	0.849	0.861	0.857	0.857
670	0.844	0.844	0.861	0.853	0.852
675	0.849	0.846	0.858	0.860	0.845
680	0.846	0.846	0.858	0.858	0.857
685	0.850	0.845	0.863	0.855	0.855
690	0.852	0.851	0.860	0.860	0.852
695	0.850	0.849	0.856	0.861	0.855
700	0.852	0.850	0.864	0.861	0.862
705	0.854	0.855	0.865	0.863	0.859
710	0.857	0.850	0.864	0.861	0.854
715	0.858	0.858	0.867	0.866	0.862
720	0.857	0.858	0.864	0.864	0.865
725	0.856	0.854	0.865	0.865	0.866
730	0.855	0.853	0.861	0.861	0.855
735	0.851	0.851	0.861	0.858	0.859
740	0.849	0.851	0.858	0.859	0.859
745	0.854	0.854	0.866	0.864	0.858
750	0.859	0.858	0.867	0.865	0.865
755	0.865	0.862	0.876	0.869	0.861
760	0.864	0.863	0.874	0.871	0.870
765	0.867	0.863	0.875	0.872	0.882
770	0.867	0.861	0.876	0.871	0.880
775	0.867	0.862	0.872	0.873	0.883
780	0.863	0.863	0.868	0.867	0.880
785	0.864	0.860	0.870	0.871	0.875

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.859	0.856	0.870	0.869	0.872
795	0.864	0.860	0.869	0.867	0.875
800	0.866	0.860	0.869	0.871	0.880
805	0.870	0.867	0.872	0.867	0.881
810	0.867	0.859	0.873	0.871	0.879
815	0.871	0.869	0.876	0.879	0.880
820	0.876	0.864	0.879	0.875	0.882
825	0.876	0.873	0.875	0.877	0.882
830	0.868	0.864	0.871	0.871	0.880
835	0.868	0.867	0.875	0.875	0.888
840	0.866	0.862	0.866	0.862	0.883
845	0.856	0.855	0.866	0.863	0.866
850	0.857	0.851	0.863	0.857	0.860
855	0.840	0.841	0.846	0.847	0.842
860	0.825	0.820	0.829	0.834	0.819
865	0.811	0.806	0.823	0.815	0.814
870	0.826	0.820	0.827	0.832	0.846
875	0.844	0.842	0.846	0.851	0.837
880	0.847	0.841	0.851	0.851	0.831
885	0.843	0.840	0.846	0.851	0.851
890	0.841	0.836	0.838	0.846	0.844
895	0.818	0.821	0.826	0.824	0.819
900	0.801	0.809	0.799	0.806	0.805
905	0.795	0.791	0.801	0.799	0.797
910	0.824	0.821	0.820	0.826	0.825
915	0.837	0.828	0.838	0.844	0.818
920	0.853	0.853	0.848	0.855	0.851
925	0.859	0.855	0.855	0.864	0.857
930	0.857	0.867	0.852	0.856	0.858
935	0.862	0.850	0.873	0.858	0.833
940	0.845	0.853	0.873	0.877	0.854
945	0.844	0.866	0.873	0.879	0.833
950	0.858	0.863	0.881	0.874	0.856

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.787	0.785	0.787	0.782	0.784
455	0.790	0.788	0.792	0.784	0.786
460	0.791	0.789	0.793	0.785	0.788
465	0.799	0.797	0.799	0.793	0.796
470	0.805	0.804	0.806	0.800	0.803
475	0.805	0.804	0.806	0.799	0.801
480	0.804	0.802	0.805	0.799	0.800
485	0.809	0.808	0.810	0.805	0.807
490	0.817	0.815	0.817	0.812	0.813
495	0.817	0.815	0.818	0.811	0.813
500	0.815	0.813	0.815	0.808	0.811
505	0.815	0.814	0.815	0.811	0.812
510	0.821	0.819	0.821	0.816	0.817
515	0.824	0.821	0.824	0.818	0.820
520	0.821	0.819	0.822	0.815	0.817
525	0.819	0.816	0.819	0.813	0.815
530	0.820	0.818	0.821	0.816	0.817
535	0.826	0.824	0.825	0.820	0.822
540	0.827	0.826	0.828	0.822	0.823
545	0.825	0.823	0.826	0.818	0.821
550	0.820	0.819	0.821	0.814	0.816
555	0.819	0.818	0.819	0.814	0.816
560	0.823	0.821	0.824	0.819	0.820
565	0.828	0.826	0.827	0.822	0.824
570	0.829	0.827	0.829	0.823	0.825
575	0.827	0.825	0.828	0.821	0.824
580	0.826	0.823	0.825	0.819	0.822
585	0.825	0.823	0.826	0.819	0.822
590	0.828	0.826	0.828	0.824	0.826
595	0.832	0.830	0.832	0.827	0.829
600	0.834	0.832	0.835	0.829	0.832
605	0.835	0.833	0.835	0.829	0.831
610	0.835	0.832	0.834	0.828	0.831
615	0.835	0.833	0.836	0.830	0.833

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.838	0.836	0.838	0.834	0.836
625	0.844	0.842	0.844	0.839	0.841
630	0.851	0.847	0.850	0.845	0.848
635	0.854	0.851	0.854	0.848	0.851
640	0.856	0.855	0.857	0.851	0.853
645	0.856	0.855	0.857	0.851	0.853
650	0.857	0.854	0.857	0.850	0.854
655	0.858	0.856	0.858	0.852	0.854
660	0.861	0.859	0.861	0.855	0.858
665	0.865	0.863	0.865	0.860	0.862
670	0.870	0.867	0.868	0.865	0.866
675	0.873	0.870	0.873	0.867	0.869
680	0.873	0.871	0.872	0.867	0.869
685	0.872	0.870	0.873	0.866	0.868
690	0.870	0.868	0.870	0.864	0.866
695	0.869	0.867	0.869	0.863	0.866
700	0.868	0.866	0.868	0.864	0.866
705	0.868	0.867	0.867	0.864	0.865
710	0.870	0.868	0.870	0.866	0.867
715	0.876	0.873	0.875	0.869	0.872
720	0.878	0.876	0.878	0.873	0.874
725	0.877	0.875	0.878	0.872	0.873
730	0.875	0.872	0.874	0.868	0.872
735	0.871	0.870	0.870	0.865	0.866
740	0.866	0.864	0.866	0.861	0.862
745	0.866	0.864	0.865	0.860	0.862
750	0.871	0.869	0.869	0.866	0.868
755	0.873	0.872	0.873	0.870	0.870
760	0.877	0.874	0.877	0.873	0.874
765	0.880	0.878	0.879	0.874	0.877
770	0.881	0.880	0.881	0.875	0.878
775	0.883	0.880	0.882	0.876	0.878
780	0.880	0.880	0.881	0.875	0.877
785	0.879	0.879	0.880	0.874	0.875

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.877	0.876	0.877	0.871	0.875
795	0.876	0.875	0.875	0.870	0.872
800	0.875	0.872	0.873	0.870	0.872
805	0.875	0.871	0.875	0.870	0.871
810	0.875	0.871	0.873	0.871	0.874
815	0.878	0.876	0.877	0.872	0.873
820	0.880	0.879	0.880	0.875	0.876
825	0.881	0.879	0.879	0.877	0.879
830	0.885	0.881	0.883	0.879	0.878
835	0.880	0.880	0.881	0.876	0.878
840	0.879	0.876	0.879	0.876	0.876
845	0.874	0.874	0.877	0.869	0.873
850	0.867	0.864	0.872	0.860	0.864
855	0.858	0.860	0.861	0.849	0.855
860	0.843	0.843	0.839	0.838	0.841
865	0.822	0.820	0.824	0.815	0.819
870	0.813	0.815	0.812	0.816	0.815
875	0.833	0.830	0.833	0.828	0.829
880	0.845	0.842	0.845	0.840	0.841
885	0.851	0.846	0.849	0.846	0.847
890	0.846	0.843	0.845	0.842	0.843
895	0.838	0.834	0.835	0.833	0.834
900	0.823	0.820	0.820	0.818	0.818
905	0.805	0.803	0.804	0.800	0.801
910	0.804	0.801	0.804	0.799	0.801
915	0.830	0.826	0.828	0.825	0.828
920	0.850	0.848	0.850	0.843	0.845
925	0.858	0.857	0.860	0.854	0.857
930	0.864	0.862	0.864	0.858	0.861
935	0.867	0.863	0.866	0.860	0.863
940	0.868	0.866	0.866	0.862	0.864
945	0.869	0.866	0.868	0.863	0.865
950	0.869	0.866	0.868	0.863	0.864

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.778	0.777	0.771	0.775	0.772
455	0.779	0.778	0.773	0.776	0.773
460	0.782	0.781	0.776	0.779	0.774
465	0.791	0.788	0.784	0.787	0.783
470	0.795	0.794	0.788	0.793	0.788
475	0.793	0.793	0.786	0.791	0.787
480	0.795	0.793	0.788	0.791	0.787
485	0.802	0.799	0.795	0.798	0.794
490	0.807	0.806	0.800	0.804	0.799
495	0.805	0.805	0.799	0.803	0.799
500	0.804	0.803	0.797	0.801	0.797
505	0.807	0.805	0.800	0.803	0.799
510	0.813	0.810	0.805	0.809	0.804
515	0.813	0.812	0.805	0.810	0.806
520	0.810	0.809	0.803	0.807	0.803
525	0.809	0.807	0.802	0.806	0.801
530	0.813	0.810	0.805	0.809	0.805
535	0.817	0.815	0.810	0.813	0.809
540	0.818	0.816	0.810	0.815	0.810
545	0.814	0.813	0.806	0.811	0.807
550	0.811	0.809	0.803	0.807	0.804
555	0.811	0.810	0.804	0.808	0.804
560	0.816	0.814	0.809	0.812	0.808
565	0.820	0.818	0.812	0.816	0.812
570	0.820	0.818	0.813	0.817	0.813
575	0.817	0.816	0.810	0.815	0.811
580	0.816	0.815	0.809	0.813	0.809
585	0.818	0.816	0.811	0.815	0.810
590	0.822	0.820	0.815	0.818	0.815
595	0.826	0.824	0.819	0.823	0.818
600	0.827	0.825	0.820	0.824	0.820
605	0.827	0.825	0.819	0.824	0.820
610	0.826	0.825	0.820	0.824	0.820
615	0.828	0.826	0.821	0.825	0.821

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.833	0.831	0.826	0.829	0.826
625	0.839	0.837	0.833	0.836	0.832
630	0.845	0.843	0.838	0.841	0.837
635	0.848	0.847	0.841	0.845	0.841
640	0.850	0.848	0.843	0.847	0.843
645	0.850	0.848	0.842	0.847	0.843
650	0.850	0.849	0.844	0.847	0.844
655	0.853	0.851	0.846	0.849	0.846
660	0.857	0.854	0.850	0.854	0.850
665	0.862	0.859	0.855	0.858	0.854
670	0.865	0.863	0.859	0.862	0.858
675	0.867	0.865	0.860	0.864	0.860
680	0.866	0.866	0.860	0.864	0.860
685	0.865	0.864	0.859	0.863	0.859
690	0.864	0.863	0.857	0.861	0.858
695	0.864	0.862	0.857	0.861	0.857
700	0.864	0.862	0.858	0.862	0.857
705	0.865	0.863	0.859	0.862	0.858
710	0.868	0.865	0.862	0.864	0.860
715	0.873	0.870	0.866	0.869	0.865
720	0.874	0.872	0.867	0.871	0.867
725	0.873	0.871	0.866	0.870	0.866
730	0.870	0.869	0.863	0.867	0.863
735	0.866	0.864	0.860	0.863	0.859
740	0.861	0.860	0.856	0.859	0.856
745	0.864	0.861	0.857	0.861	0.856
750	0.869	0.866	0.863	0.866	0.862
755	0.873	0.870	0.867	0.869	0.866
760	0.877	0.874	0.871	0.873	0.869
765	0.879	0.877	0.873	0.876	0.872
770	0.880	0.878	0.875	0.877	0.873
775	0.880	0.878	0.874	0.877	0.873
780	0.879	0.877	0.874	0.876	0.873
785	0.877	0.875	0.871	0.874	0.871

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.875	0.873	0.870	0.872	0.869
795	0.874	0.872	0.867	0.871	0.867
800	0.873	0.871	0.868	0.870	0.866
805	0.873	0.871	0.869	0.871	0.867
810	0.875	0.873	0.870	0.872	0.869
815	0.878	0.875	0.873	0.875	0.871
820	0.880	0.878	0.875	0.877	0.874
825	0.881	0.880	0.878	0.879	0.875
830	0.882	0.881	0.878	0.881	0.878
835	0.880	0.881	0.879	0.880	0.879
840	0.878	0.880	0.878	0.880	0.879
845	0.876	0.878	0.878	0.878	0.878
850	0.869	0.871	0.872	0.873	0.873
855	0.855	0.861	0.862	0.861	0.863
860	0.845	0.842	0.844	0.844	0.845
865	0.848	0.826	0.797	0.818	0.787
870	0.839	0.816	0.788	0.809	0.778
875	0.849	0.826	0.798	0.819	0.788
880	0.864	0.840	0.811	0.833	0.801
885	0.871	0.847	0.819	0.841	0.808
890	0.870	0.847	0.818	0.839	0.807
895	0.862	0.840	0.812	0.832	0.800
900	0.848	0.826	0.798	0.818	0.787
905	0.829	0.808	0.781	0.800	0.769
910	0.814	0.793	0.766	0.785	0.756
915	0.840	0.818	0.790	0.811	0.781
920	0.864	0.842	0.813	0.834	0.803
925	0.876	0.854	0.825	0.846	0.815
930	0.882	0.860	0.831	0.852	0.820
935	0.885	0.862	0.833	0.854	0.823
940	0.886	0.864	0.836	0.856	0.825
945	0.888	0.865	0.837	0.857	0.825
950	0.888	0.866	0.837	0.858	0.827

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.79	0.79	0.788	0.792	0.781
455	0.792	0.792	0.79	0.795	0.783
460	0.794	0.794	0.791	0.796	0.784
465	0.801	0.801	0.798	0.804	0.791
470	0.807	0.807	0.805	0.809	0.797
475	0.807	0.806	0.804	0.808	0.797
480	0.806	0.805	0.802	0.807	0.796
485	0.811	0.811	0.808	0.814	0.801
490	0.818	0.818	0.815	0.82	0.807
495	0.819	0.817	0.816	0.82	0.808
500	0.816	0.815	0.813	0.817	0.806
505	0.816	0.817	0.814	0.819	0.807
510	0.821	0.821	0.819	0.824	0.812
515	0.824	0.824	0.821	0.826	0.814
520	0.823	0.821	0.819	0.823	0.812
525	0.82	0.819	0.816	0.821	0.809
530	0.82	0.821	0.818	0.823	0.811
535	0.826	0.825	0.821	0.827	0.815
540	0.828	0.826	0.824	0.829	0.817
545	0.825	0.823	0.821	0.825	0.814
550	0.821	0.819	0.817	0.821	0.81
555	0.82	0.819	0.816	0.821	0.81
560	0.824	0.823	0.82	0.825	0.813
565	0.828	0.826	0.824	0.829	0.817
570	0.829	0.827	0.825	0.83	0.819
575	0.828	0.825	0.824	0.828	0.817
580	0.826	0.824	0.821	0.826	0.815
585	0.826	0.824	0.821	0.826	0.816
590	0.829	0.828	0.824	0.83	0.818
595	0.833	0.832	0.829	0.834	0.821
600	0.835	0.834	0.831	0.836	0.824
605	0.836	0.833	0.831	0.836	0.824
610	0.836	0.833	0.831	0.835	0.823
615	0.836	0.834	0.832	0.836	0.824

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.839	0.838	0.835	0.84	0.828
625	0.844	0.843	0.84	0.846	0.832
630	0.85	0.843	0.845	0.851	0.838
635	0.855	0.853	0.85	0.856	0.843
640	0.857	0.854	0.853	0.858	0.845
645	0.857	0.855	0.853	0.858	0.845
650	0.857	0.855	0.853	0.858	0.845
655	0.859	0.857	0.854	0.86	0.847
660	0.861	0.86	0.857	0.863	0.85
665	0.866	0.865	0.861	0.868	0.854
670	0.869	0.868	0.865	0.872	0.857
675	0.872	0.871	0.868	0.874	0.86
680	0.872	0.871	0.868	0.874	0.861
685	0.872	0.87	0.868	0.873	0.86
690	0.871	0.869	0.866	0.872	0.858
695	0.869	0.868	0.865	0.87	0.857
700	0.869	0.868	0.864	0.87	0.857
705	0.868	0.868	0.865	0.87	0.857
710	0.871	0.87	0.866	0.872	0.859
715	0.875	0.875	0.871	0.877	0.864
720	0.877	0.877	0.874	0.88	0.866
725	0.877	0.876	0.874	0.879	0.866
730	0.875	0.874	0.871	0.876	0.864
735	0.871	0.869	0.867	0.872	0.86
740	0.868	0.866	0.863	0.868	0.856
745	0.866	0.865	0.863	0.867	0.854
750	0.871	0.871	0.868	0.873	0.86
755	0.875	0.874	0.872	0.877	0.864
760	0.877	0.877	0.875	0.88	0.866
765	0.881	0.88	0.877	0.883	0.869
770	0.882	0.882	0.879	0.885	0.872
775	0.883	0.883	0.88	0.885	0.872
780	0.882	0.882	0.879	0.885	0.872
785	0.881	0.88	0.877	0.883	0.871

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.879	0.877	0.876	0.881	0.869
795	0.877	0.877	0.874	0.879	0.867
800	0.876	0.875	0.874	0.877	0.866
805	0.876	0.875	0.873	0.877	0.865
810	0.876	0.877	0.874	0.879	0.866
815	0.878	0.879	0.875	0.881	0.868
820	0.881	0.881	0.877	0.884	0.871
825	0.883	0.882	0.879	0.885	0.872
830	0.883	0.883	0.881	0.886	0.873
835	0.883	0.882	0.88	0.885	0.872
840	0.881	0.881	0.878	0.884	0.871
845	0.877	0.877	0.875	0.88	0.867
850	0.871	0.87	0.868	0.872	0.86
855	0.86	0.86	0.857	0.862	0.85
860	0.845	0.844	0.842	0.847	0.835
865	0.824	0.824	0.821	0.826	0.815
870	0.819	0.819	0.816	0.822	0.81
875	0.836	0.836	0.834	0.839	0.827
880	0.85	0.849	0.847	0.851	0.839
885	0.854	0.854	0.851	0.857	0.844
890	0.851	0.85	0.848	0.853	0.84
895	0.843	0.84	0.839	0.844	0.832
900	0.827	0.824	0.823	0.829	0.816
905	0.807	0.805	0.803	0.809	0.797
910	0.8	0.798	0.797	0.801	0.79
915	0.835	0.833	0.832	0.836	0.825
920	0.854	0.852	0.85	0.855	0.843
925	0.865	0.861	0.86	0.865	0.853
930	0.869	0.866	0.865	0.869	0.857
935	0.871	0.868	0.866	0.872	0.86
940	0.872	0.869	0.868	0.873	0.861
945	0.873	0.869	0.868	0.874	0.862
950	0.872	0.87	0.868	0.873	0.861

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR,INC.				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.809	0.819	0.801	0.807	0.802
455	0.819	0.828	0.810	0.817	0.812
460	0.830	0.843	0.816	0.821	0.816
465	0.830	0.837	0.828	0.832	0.828
470	0.834	0.840	0.827	0.834	0.827
475	0.838	0.844	0.828	0.835	0.828
480	0.840	0.846	0.829	0.835	0.828
485	0.838	0.845	0.831	0.838	0.828
490	0.844	0.847	0.835	0.842	0.834
495	0.844	0.850	0.838	0.844	0.840
500	0.844	0.851	0.838	0.844	0.839
505	0.843	0.847	0.836	0.842	0.832
510	0.845	0.849	0.838	0.842	0.834
515	0.849	0.851	0.841	0.846	0.839
520	0.851	0.852	0.841	0.846	0.840
525	0.845	0.849	0.836	0.841	0.836
530	0.846	0.849	0.835	0.841	0.837
535	0.847	0.850	0.838	0.843	0.837
540	0.849	0.854	0.841	0.846	0.840
545	0.849	0.852	0.840	0.844	0.840
550	0.847	0.849	0.837	0.843	0.840
555	0.844	0.846	0.834	0.839	0.839
560	0.844	0.846	0.834	0.841	0.844
565	0.848	0.850	0.838	0.845	0.847
570	0.849	0.852	0.839	0.846	0.843
575	0.851	0.855	0.840	0.847	0.844
580	0.849	0.853	0.837	0.846	0.844
585	0.847	0.851	0.836	0.844	0.844
590	0.849	0.852	0.838	0.844	0.846
595	0.852	0.855	0.841	0.847	0.850
600	0.857	0.859	0.844	0.852	0.856
605	0.856	0.860	0.845	0.853	0.856
610	0.857	0.860	0.844	0.852	0.857
615	0.860	0.862	0.847	0.855	0.861

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR,INC.				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.864	0.866	0.851	0.860	0.865
625	0.869	0.871	0.855	0.865	0.869
630	0.875	0.875	0.861	0.869	0.875
635	0.880	0.882	0.866	0.875	0.881
640	0.884	0.885	0.869	0.877	0.883
645	0.884	0.886	0.870	0.877	0.885
650	0.884	0.885	0.870	0.877	0.886
655	0.887	0.886	0.871	0.879	0.888
660	0.889	0.888	0.874	0.880	0.890
665	0.891	0.890	0.877	0.883	0.894
670	0.895	0.895	0.879	0.887	0.896
675	0.899	0.898	0.884	0.890	0.899
680	0.901	0.900	0.887	0.891	0.903
685	0.900	0.900	0.886	0.891	0.901
690	0.902	0.900	0.886	0.891	0.902
695	0.900	0.899	0.885	0.890	0.901
700	0.897	0.897	0.884	0.888	0.897
705	0.895	0.896	0.880	0.885	0.896
710	0.897	0.898	0.883	0.888	0.897
715	0.903	0.902	0.889	0.891	0.900
720	0.906	0.907	0.891	0.896	0.905
725	0.903	0.903	0.890	0.896	0.903
730	0.905	0.906	0.890	0.896	0.904
735	0.902	0.901	0.887	0.891	0.899
740	0.896	0.897	0.880	0.886	0.893
745	0.895	0.896	0.880	0.885	0.892
750	0.898	0.902	0.885	0.890	0.897
755	0.900	0.902	0.886	0.893	0.898
760	0.904	0.907	0.891	0.896	0.903
765	0.908	0.909	0.893	0.900	0.905
770	0.910	0.911	0.894	0.902	0.907
775	0.912	0.913	0.896	0.904	0.908
780	0.913	0.913	0.899	0.904	0.909
785	0.912	0.914	0.897	0.904	0.911

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR,INC.				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.910	0.910	0.895	0.901	0.909
795	0.909	0.909	0.894	0.899	0.906
800	0.908	0.909	0.893	0.899	0.906
805	0.907	0.907	0.891	0.898	0.904
810	0.908	0.908	0.891	0.897	0.904
815	0.907	0.908	0.891	0.898	0.905
820	0.911	0.909	0.894	0.901	0.907
825	0.914	0.912	0.895	0.903	0.910
830	0.913	0.911	0.895	0.903	0.910
835	0.912	0.911	0.893	0.901	0.908
840	0.912	0.910	0.892	0.902	0.905
845	0.908	0.906	0.890	0.898	0.902
850	0.901	0.897	0.882	0.890	0.896
855	0.889	0.888	0.869	0.878	0.886
860	0.870	0.871	0.852	0.861	0.866
865	0.850	0.850	0.832	0.841	0.844
870	0.846	0.848	0.827	0.836	0.840
875	0.862	0.862	0.842	0.850	0.855
880	0.874	0.874	0.853	0.863	0.867
885	0.879	0.878	0.858	0.867	0.872
890	0.879	0.875	0.856	0.863	0.871
895	0.866	0.867	0.842	0.851	0.859
900	0.846	0.846	0.824	0.832	0.840
905	0.826	0.824	0.803	0.809	0.818
910	0.829	0.828	0.806	0.812	0.821
915	0.859	0.862	0.836	0.843	0.851
920	0.879	0.880	0.857	0.863	0.871
925	0.891	0.891	0.869	0.875	0.883
930	0.896	0.897	0.874	0.880	0.889
935	0.898	0.898	0.876	0.881	0.891
940	0.897	0.896	0.875	0.881	0.890
945	0.899	0.898	0.875	0.884	0.894
950	0.899	0.898	0.876	0.883	0.893

	UV/VIS/NIR SPECTROPHOTOMETER - SIERRACIN/SYLMAR CORP.				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.769	0.765	0.767	0.766	0.763
455	0.771	0.767	0.768	0.767	0.764
460	0.774	0.770	0.771	0.770	0.770
465	0.783	0.778	0.781	0.778	0.777
470	0.789	0.784	0.786	0.783	0.779
475	0.787	0.782	0.783	0.782	0.779
480	0.788	0.785	0.787	0.784	0.784
485	0.796	0.792	0.794	0.793	0.792
490	0.801	0.797	0.799	0.797	0.794
495	0.800	0.796	0.798	0.796	0.793
500	0.799	0.795	0.797	0.794	0.793
505	0.802	0.798	0.801	0.798	0.798
510	0.807	0.803	0.806	0.803	0.802
515	0.809	0.805	0.806	0.804	0.801
520	0.806	0.801	0.804	0.801	0.799
525	0.805	0.801	0.803	0.800	0.800
530	0.808	0.804	0.808	0.805	0.805
535	0.813	0.809	0.812	0.809	0.808
540	0.813	0.808	0.811	0.809	0.806
545	0.810	0.806	0.807	0.806	0.802
550	0.807	0.803	0.805	0.802	0.801
555	0.808	0.804	0.807	0.803	0.804
560	0.812	0.808	0.811	0.809	0.809
565	0.815	0.812	0.813	0.812	0.810
570	0.816	0.813	0.814	0.811	0.809
575	0.814	0.810	0.812	0.810	0.808
580	0.813	0.810	0.812	0.809	0.808
585	0.815	0.811	0.813	0.811	0.812
590	0.818	0.815	0.817	0.815	0.815
595	0.822	0.818	0.820	0.818	0.816
600	0.823	0.819	0.821	0.819	0.817
605	0.823	0.819	0.821	0.819	0.816
610	0.824	0.820	0.821	0.819	0.817
615	0.825	0.822	0.824	0.821	0.822

	UV/VIS/NIR SPECTROPHOTOMETER - SIERRACIN/SYLMAR CORP.				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.829	0.826	0.828	0.827	0.827
625	0.835	0.832	0.834	0.832	0.833
630	0.841	0.838	0.839	0.838	0.837
635	0.844	0.841	0.843	0.840	0.838
640	0.846	0.843	0.844	0.842	0.839
645	0.846	0.843	0.843	0.842	0.840
650	0.847	0.843	0.845	0.843	0.842
655	0.849	0.846	0.848	0.845	0.846
660	0.853	0.850	0.852	0.851	0.851
665	0.858	0.855	0.856	0.854	0.855
670	0.861	0.857	0.860	0.858	0.857
675	0.863	0.860	0.862	0.859	0.858
680	0.863	0.860	0.860	0.859	0.857
685	0.862	0.860	0.860	0.858	0.856
690	0.861	0.857	0.859	0.857	0.857
695	0.861	0.857	0.860	0.857	0.856
700	0.861	0.858	0.860	0.858	0.859
705	0.862	0.859	0.861	0.859	0.859
710	0.864	0.861	0.863	0.861	0.861
715	0.869	0.865	0.866	0.866	0.865
720	0.871	0.868	0.870	0.867	0.865
725	0.869	0.866	0.867	0.866	0.863
730	0.867	0.864	0.865	0.862	0.861
735	0.862	0.859	0.861	0.859	0.857
740	0.859	0.856	0.858	0.856	0.855
745	0.860	0.857	0.859	0.857	0.856
750	0.866	0.863	0.865	0.863	0.862
755	0.869	0.865	0.868	0.867	0.867
760	0.873	0.871	0.873	0.870	0.871
765	0.876	0.873	0.875	0.873	0.872
770	0.878	0.875	0.877	0.874	0.874
775	0.876	0.874	0.876	0.873	0.873
780	0.875	0.872	0.874	0.872	0.870
785	0.874	0.872	0.872	0.870	0.869

	UV/VIS/NIR SPECTROPHOTOMETER - SIERRACIN/SYLMAR CORP.				
			SAMPLE 2		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.873	0.870	0.872	0.869	0.867
795	0.871	0.868	0.869	0.868	0.867
800	0.871	0.867	0.869	0.867	0.867
805	0.871	0.869	0.871	0.867	0.868
810	0.872	0.870	0.872	0.868	0.869
815	0.875	0.871	0.874	0.872	0.873
820	0.878	0.875	0.877	0.873	0.874
825	0.877	0.875	0.877	0.876	0.876
830	0.881	0.878	0.879	0.876	0.874
835	0.880	0.878	0.878	0.876	0.873
840	0.878	0.875	0.876	0.874	0.871
845	0.872	0.867	0.870	0.869	0.868
850	0.865	0.860	0.865	0.863	0.861
855	0.853	0.851	0.856	0.853	0.852
860	0.838	0.836	0.838	0.834	0.835
865	0.825	0.832	0.835	0.820	0.822
870	0.833	0.830	0.831	0.822	0.823
875	0.832	0.835	0.842	0.836	0.838
880	0.864	0.854	0.862	0.849	0.853
885	0.863	0.864	0.864	0.855	0.856
890	0.855	0.853	0.858	0.850	0.849
895	0.845	0.847	0.849	0.841	0.839
900	0.829	0.825	0.830	0.822	0.824
905	0.811	0.808	0.813	0.802	0.802
910	0.801	0.804	0.808	0.801	0.802
915	0.836	0.836	0.836	0.834	0.834
920	0.853	0.856	0.866	0.853	0.852
925	0.876	0.873	0.873	0.859	0.860
930	0.859	0.867	0.867	0.864	0.863
935	0.878	0.872	0.878	0.868	0.868
940	0.884	0.877	0.881	0.868	0.868
945	0.865	0.867	0.870	0.869	0.871
950	0.877	0.876	0.882	0.870	0.875

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.481	0.482	0.484	0.494	0.490
455	0.512	0.514	0.519	0.514	0.509
460	0.497	0.497	0.505	0.505	0.494
465	0.522	0.520	0.528	0.528	0.525
470	0.528	0.532	0.528	0.539	0.497
475	0.514	0.516	0.513	0.523	0.529
480	0.564	0.558	0.567	0.564	0.540
485	0.543	0.547	0.544	0.544	0.534
490	0.560	0.562	0.568	0.564	0.561
495	0.589	0.596	0.596	0.595	0.559
500	0.569	0.563	0.572	0.570	0.566
505	0.597	0.597	0.606	0.603	0.608
510	0.618	0.624	0.626	0.623	0.574
515	0.586	0.587	0.588	0.589	0.589
520	0.618	0.623	0.630	0.627	0.628
525	0.644	0.650	0.651	0.645	0.594
530	0.593	0.597	0.598	0.599	0.602
535	0.629	0.625	0.628	0.633	0.636
540	0.666	0.666	0.671	0.667	0.619
545	0.608	0.612	0.615	0.615	0.601
550	0.619	0.616	0.621	0.621	0.649
555	0.678	0.671	0.676	0.676	0.648
560	0.641	0.643	0.639	0.644	0.595
565	0.597	0.595	0.598	0.600	0.615
570	0.641	0.642	0.647	0.646	0.661
575	0.676	0.679	0.682	0.685	0.618
580	0.616	0.616	0.618	0.621	0.588
585	0.594	0.595	0.596	0.600	0.639
590	0.668	0.670	0.672	0.672	0.660
595	0.678	0.679	0.677	0.684	0.617
600	0.607	0.611	0.612	0.611	0.586
605	0.595	0.591	0.595	0.595	0.634
610	0.664	0.663	0.666	0.668	0.665
615	0.683	0.685	0.691	0.691	0.612

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.602	0.606	0.609	0.609	0.568
625	0.571	0.571	0.576	0.575	0.601
630	0.624	0.622	0.628	0.626	0.665
635	0.683	0.687	0.691	0.692	0.641
640	0.632	0.642	0.639	0.640	0.573
645	0.559	0.564	0.566	0.563	0.554
650	0.571	0.567	0.578	0.575	0.615
655	0.653	0.648	0.655	0.655	0.660
660	0.679	0.684	0.682	0.684	0.596
665	0.568	0.577	0.569	0.576	0.545
670	0.573	0.588	0.587	0.581	0.540
675	0.543	0.540	0.545	0.546	0.594
680	0.625	0.623	0.631	0.630	0.638
685	0.656	0.661	0.659	0.659	0.590
690	0.599	0.607	0.603	0.603	0.529
695	0.519	0.522	0.520	0.525	0.507
700	0.515	0.517	0.522	0.523	0.566
705	0.583	0.574	0.583	0.585	0.622
710	0.651	0.650	0.657	0.658	0.623
715	0.626	0.634	0.632	0.632	0.549
720	0.545	0.554	0.545	0.554	0.496
725	0.486	0.488	0.491	0.492	0.506
730	0.507	0.504	0.506	0.510	0.557
735	0.569	0.562	0.572	0.571	0.615
740	0.627	0.631	0.631	0.632	0.585
745	0.598	0.606	0.603	0.605	0.523
750	0.521	0.529	0.524	0.529	0.469
755	0.464	0.466	0.465	0.466	0.468
760	0.474	0.470	0.473	0.472	0.518
765	0.529	0.522	0.527	0.528	0.586
770	0.604	0.602	0.609	0.608	0.597
775	0.612	0.610	0.612	0.615	0.548
780	0.549	0.559	0.547	0.553	0.472
785	0.461	0.471	0.465	0.471	0.438

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.436	0.437	0.440	0.440	0.443
795	0.454	0.451	0.457	0.456	0.508
800	0.521	0.511	0.523	0.520	0.566
805	0.580	0.575	0.576	0.575	0.581
810	0.589	0.588	0.593	0.591	0.529
815	0.525	0.537	0.528	0.533	0.463
820	0.456	0.467	0.462	0.463	0.429
825	0.420	0.421	0.418	0.424	0.417
830	0.423	0.415	0.423	0.420	0.443
835	0.454	0.450	0.455	0.452	0.494
840	0.511	0.511	0.511	0.510	0.556
845	0.567	0.562	0.568	0.568	0.536
850	0.545	0.548	0.551	0.554	0.472
855	0.483	0.499	0.488	0.497	0.412
860	0.404	0.412	0.405	0.413	0.371
865	0.366	0.373	0.371	0.368	0.379
870	0.368	0.366	0.366	0.370	0.395
875	0.401	0.398	0.398	0.398	0.450
880	0.449	0.443	0.451	0.451	0.490
885	0.496	0.491	0.500	0.503	0.507
890	0.516	0.510	0.515	0.517	0.454
895	0.466	0.481	0.482	0.480	0.390
900	0.413	0.428	0.423	0.425	0.355
905	0.364	0.382	0.375	0.375	0.361
910	0.340	0.353	0.348	0.345	0.358
915	0.344	0.345	0.355	0.350	0.380
920	0.373	0.367	0.378	0.371	0.416
925	0.417	0.417	0.431	0.421	0.471
930	0.469	0.474	0.464	0.459	0.482
935	0.499	0.506	0.509	0.519	0.468
940	0.496	0.513	0.500	0.513	0.424
945	0.439	0.476	0.466	0.458	0.376
950	0.406	0.412	0.412	0.415	0.360

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.450	0.450	0.450	0.448	0.448
455	0.530	0.531	0.530	0.531	0.531
460	0.486	0.485	0.486	0.482	0.483
465	0.519	0.520	0.520	0.521	0.523
470	0.550	0.550	0.550	0.546	0.547
475	0.507	0.507	0.507	0.508	0.508
480	0.599	0.599	0.599	0.599	0.599
485	0.549	0.549	0.550	0.546	0.546
490	0.578	0.578	0.577	0.580	0.580
495	0.640	0.640	0.640	0.637	0.638
500	0.572	0.572	0.573	0.569	0.570
505	0.629	0.630	0.628	0.631	0.632
510	0.665	0.665	0.665	0.661	0.661
515	0.587	0.587	0.589	0.586	0.586
520	0.654	0.654	0.654	0.656	0.657
525	0.692	0.691	0.692	0.688	0.688
530	0.601	0.601	0.603	0.599	0.599
535	0.647	0.648	0.648	0.650	0.651
540	0.720	0.720	0.720	0.717	0.717
545	0.627	0.626	0.627	0.622	0.623
550	0.622	0.622	0.622	0.623	0.624
555	0.727	0.727	0.726	0.726	0.728
560	0.679	0.679	0.679	0.674	0.674
565	0.596	0.596	0.596	0.594	0.595
570	0.665	0.665	0.664	0.667	0.668
575	0.736	0.736	0.736	0.732	0.734
580	0.633	0.632	0.633	0.627	0.629
585	0.590	0.590	0.591	0.590	0.591
590	0.691	0.692	0.690	0.694	0.695
595	0.732	0.732	0.731	0.727	0.729
600	0.617	0.616	0.618	0.612	0.612
605	0.578	0.578	0.578	0.579	0.579
610	0.680	0.681	0.679	0.683	0.685
615	0.740	0.739	0.738	0.736	0.738

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.632	0.631	0.632	0.626	0.627
625	0.560	0.560	0.561	0.559	0.560
630	0.626	0.626	0.625	0.629	0.631
635	0.734	0.734	0.731	0.733	0.735
640	0.682	0.682	0.682	0.676	0.677
645	0.562	0.562	0.562	0.558	0.559
650	0.546	0.546	0.546	0.547	0.548
655	0.651	0.652	0.651	0.656	0.657
660	0.729	0.729	0.728	0.726	0.729
665	0.642	0.641	0.642	0.635	0.636
670	0.534	0.533	0.534	0.531	0.531
675	0.530	0.530	0.530	0.532	0.533
680	0.631	0.631	0.630	0.635	0.636
685	0.715	0.715	0.713	0.713	0.714
690	0.646	0.646	0.646	0.640	0.640
695	0.533	0.534	0.534	0.530	0.530
700	0.499	0.499	0.500	0.500	0.501
705	0.562	0.563	0.562	0.566	0.567
710	0.671	0.671	0.669	0.672	0.674
715	0.685	0.684	0.683	0.679	0.681
720	0.580	0.579	0.579	0.574	0.574
725	0.490	0.489	0.490	0.487	0.488
730	0.479	0.479	0.478	0.479	0.481
735	0.547	0.547	0.546	0.551	0.551
740	0.644	0.644	0.641	0.645	0.647
745	0.654	0.654	0.652	0.650	0.651
750	0.560	0.559	0.559	0.554	0.554
755	0.469	0.469	0.469	0.466	0.466
760	0.445	0.445	0.446	0.446	0.446
765	0.491	0.492	0.492	0.496	0.496
770	0.586	0.586	0.585	0.589	0.590
775	0.651	0.650	0.648	0.648	0.650
780	0.605	0.607	0.606	0.601	0.601
785	0.505	0.505	0.505	0.500	0.500

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.436	0.435	0.435	0.433	0.433
795	0.424	0.424	0.423	0.424	0.425
800	0.468	0.468	0.467	0.471	0.472
805	0.553	0.553	0.551	0.556	0.558
810	0.619	0.620	0.617	0.619	0.622
815	0.596	0.598	0.596	0.593	0.592
820	0.509	0.508	0.508	0.504	0.503
825	0.431	0.430	0.431	0.428	0.428
830	0.398	0.396	0.398	0.397	0.396
835	0.410	0.410	0.409	0.412	0.413
840	0.465	0.466	0.465	0.470	0.470
845	0.546	0.546	0.543	0.549	0.548
850	0.592	0.589	0.590	0.590	0.590
855	0.555	0.558	0.554	0.548	0.549
860	0.466	0.469	0.465	0.461	0.459
865	0.388	0.387	0.385	0.388	0.385
870	0.348	0.351	0.348	0.348	0.350
875	0.376	0.376	0.376	0.375	0.376
880	0.404	0.404	0.403	0.404	0.406
885	0.452	0.451	0.450	0.453	0.454
890	0.496	0.496	0.494	0.496	0.498
895	0.506	0.506	0.504	0.504	0.505
900	0.467	0.466	0.466	0.463	0.463
905	0.408	0.408	0.407	0.404	0.404
910	0.359	0.358	0.358	0.356	0.356
915	0.336	0.336	0.335	0.335	0.335
920	0.338	0.338	0.337	0.338	0.338
925	0.362	0.362	0.361	0.363	0.364
930	0.408	0.408	0.407	0.410	0.411
935	0.465	0.464	0.464	0.467	0.469
940	0.507	0.507	0.506	0.507	0.509
945	0.504	0.504	0.502	0.500	0.502
950	0.456	0.456	0.456	0.452	0.453

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.445	0.438	0.434	0.435	0.433
455	0.529	0.531	0.527	0.522	0.524
460	0.458	0.462	0.457	0.461	0.455
465	0.539	0.526	0.524	0.517	0.521
470	0.512	0.524	0.518	0.522	0.516
475	0.516	0.503	0.500	0.497	0.498
480	0.589	0.592	0.588	0.585	0.585
485	0.520	0.524	0.518	0.522	0.515
490	0.598	0.582	0.580	0.572	0.577
495	0.606	0.619	0.613	0.614	0.610
500	0.555	0.552	0.547	0.549	0.544
505	0.645	0.632	0.630	0.622	0.627
510	0.624	0.637	0.631	0.634	0.628
515	0.575	0.569	0.564	0.565	0.561
520	0.673	0.658	0.655	0.646	0.653
525	0.648	0.664	0.657	0.660	0.653
530	0.581	0.580	0.574	0.577	0.571
535	0.673	0.653	0.651	0.641	0.648
540	0.685	0.698	0.692	0.692	0.688
545	0.592	0.596	0.589	0.595	0.586
550	0.641	0.623	0.620	0.613	0.617
555	0.721	0.722	0.718	0.711	0.714
560	0.624	0.641	0.633	0.640	0.630
565	0.587	0.582	0.576	0.577	0.573
570	0.693	0.673	0.671	0.660	0.668
575	0.700	0.714	0.708	0.708	0.704
580	0.588	0.599	0.591	0.599	0.588
585	0.601	0.587	0.582	0.579	0.580
590	0.716	0.701	0.698	0.687	0.695
595	0.685	0.704	0.696	0.700	0.693
600	0.572	0.584	0.575	0.583	0.572
605	0.590	0.574	0.570	0.567	0.567
610	0.713	0.693	0.691	0.679	0.688
615	0.702	0.719	0.712	0.713	0.708

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.581	0.598	0.589	0.598	0.586
625	0.559	0.552	0.546	0.546	0.544
630	0.663	0.640	0.637	0.626	0.634
635	0.726	0.732	0.726	0.720	0.723
640	0.620	0.645	0.636	0.646	0.633
645	0.529	0.537	0.529	0.536	0.527
650	0.567	0.548	0.544	0.540	0.541
655	0.690	0.667	0.665	0.651	0.661
660	0.704	0.716	0.710	0.708	0.706
665	0.583	0.605	0.596	0.606	0.594
670	0.511	0.516	0.509	0.514	0.506
675	0.552	0.535	0.531	0.526	0.528
680	0.668	0.647	0.644	0.632	0.641
685	0.697	0.707	0.701	0.697	0.698
690	0.587	0.612	0.603	0.612	0.599
695	0.499	0.508	0.500	0.508	0.498
700	0.506	0.495	0.490	0.489	0.488
705	0.599	0.575	0.572	0.562	0.570
710	0.688	0.680	0.676	0.665	0.672
715	0.640	0.661	0.653	0.656	0.650
720	0.526	0.546	0.537	0.547	0.535
725	0.468	0.472	0.466	0.470	0.463
730	0.493	0.481	0.477	0.474	0.474
735	0.584	0.564	0.561	0.551	0.559
740	0.659	0.655	0.651	0.642	0.648
745	0.612	0.635	0.627	0.631	0.624
750	0.505	0.527	0.518	0.528	0.515
755	0.443	0.449	0.442	0.448	0.440
760	0.451	0.442	0.438	0.437	0.435
765	0.523	0.503	0.500	0.492	0.497
770	0.619	0.602	0.600	0.588	0.596
775	0.639	0.647	0.642	0.637	0.638
780	0.554	0.578	0.569	0.576	0.567
785	0.460	0.476	0.468	0.477	0.466

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.417	0.420	0.414	0.418	0.412
795	0.434	0.424	0.420	0.418	0.417
800	0.501	0.482	0.479	0.471	0.477
805	0.588	0.572	0.570	0.559	0.567
810	0.617	0.623	0.618	0.613	0.615
815	0.552	0.574	0.566	0.572	0.564
820	0.460	0.480	0.471	0.481	0.470
825	0.403	0.411	0.406	0.411	0.403
830	0.393	0.391	0.387	0.388	0.385
835	0.428	0.418	0.415	0.411	0.413
840	0.499	0.485	0.483	0.474	0.481
845	0.573	0.566	0.564	0.552	0.562
850	0.580	0.592	0.590	0.584	0.587
855	0.510	0.536	0.530	0.534	0.529
860	0.425	0.446	0.439	0.447	0.438
865	0.421	0.414	0.402	0.412	0.397
870	0.383	0.369	0.362	0.367	0.358
875	0.384	0.363	0.355	0.360	0.351
880	0.419	0.391	0.381	0.385	0.377
885	0.476	0.444	0.432	0.435	0.427
890	0.531	0.503	0.489	0.492	0.482
895	0.540	0.527	0.511	0.517	0.502
900	0.490	0.490	0.473	0.484	0.466
905	0.420	0.421	0.407	0.417	0.401
910	0.364	0.362	0.350	0.360	0.345
915	0.341	0.333	0.322	0.330	0.318
920	0.348	0.333	0.323	0.329	0.318
925	0.377	0.356	0.346	0.350	0.341
930	0.430	0.402	0.391	0.393	0.386
935	0.494	0.464	0.451	0.453	0.445
940	0.536	0.515	0.501	0.504	0.493
945	0.526	0.519	0.503	0.511	0.496
950	0.473	0.474	0.458	0.470	0.452

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.441	0.457	0.458	0.456	0.45
455	0.539	0.531	0.537	0.538	0.537
460	0.472	0.464	0.459	0.46	0.464
465	0.523	0.544	0.553	0.551	0.541
470	0.541	0.513	0.509	0.511	0.522
475	0.503	0.526	0.529	0.526	0.518
480	0.604	0.59	0.594	0.597	0.598
485	0.535	0.524	0.521	0.521	0.526
490	0.58	0.605	0.614	0.611	0.598
495	0.636	0.606	0.606	0.61	0.618
500	0.558	0.561	0.559	0.558	0.558
505	0.63	0.652	0.661	0.659	0.647
510	0.658	0.624	0.623	0.627	0.638
515	0.574	0.582	0.58	0.578	0.576
520	0.656	0.679	0.689	0.687	0.675
525	0.687	0.65	0.649	0.652	0.664
530	0.585	0.587	0.584	0.584	0.585
535	0.649	0.68	0.69	0.687	0.672
540	0.719	0.685	0.687	0.691	0.7
545	0.609	0.595	0.59	0.591	0.598
550	0.615	0.648	0.655	0.652	0.637
555	0.733	0.723	0.732	0.733	0.731
560	0.664	0.626	0.621	0.625	0.64
565	0.582	0.594	0.593	0.592	0.588
570	0.666	0.699	0.709	0.707	0.691
575	0.736	0.697	0.7	0.705	0.715
580	0.615	0.59	0.583	0.587	0.597
585	0.58	0.606	0.609	0.606	0.596
590	0.696	0.722	0.733	0.731	0.717
595	0.728	0.684	0.682	0.688	0.702
600	0.597	0.576	0.569	0.572	0.583
605	0.568	0.594	0.596	0.593	0.584
610	0.686	0.716	0.729	0.725	0.709
615	0.74	0.7	0.7	0.707	0.717

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.615	0.583	0.576	0.581	0.593
625	0.548	0.563	0.562	0.561	0.556
630	0.626	0.666	0.676	0.672	0.654
635	0.742	0.729	0.736	0.74	0.738
640	0.671	0.624	0.617	0.624	0.641
645	0.546	0.535	0.529	0.531	0.538
650	0.537	0.568	0.57	0.568	0.557
655	0.655	0.691	0.701	0.699	0.682
660	0.735	0.704	0.708	0.714	0.719
665	0.63	0.588	0.578	0.587	0.603
670	0.519	0.515	0.509	0.511	0.516
675	0.522	0.554	0.556	0.553	0.542
680	0.628	0.668	0.677	0.675	0.656
685	0.72	0.699	0.704	0.708	0.71
690	0.635	0.59	0.582	0.589	0.606
695	0.516	0.502	0.494	0.498	0.506
700	0.488	0.507	0.506	0.505	0.499
705	0.555	0.597	0.604	0.601	0.582
710	0.674	0.689	0.699	0.7	0.688
715	0.684	0.642	0.64	0.647	0.659
720	0.568	0.531	0.522	0.528	0.543
725	0.477	0.471	0.465	0.467	0.472
730	0.469	0.493	0.493	0.492	0.484
735	0.542	0.585	0.593	0.59	0.571
740	0.648	0.664	0.673	0.673	0.662
745	0.656	0.619	0.617	0.624	0.635
750	0.546	0.511	0.5	0.507	0.523
755	0.455	0.445	0.437	0.44	0.447
760	0.434	0.448	0.445	0.445	0.441
765	0.482	0.519	0.524	0.521	0.506
770	0.584	0.619	0.629	0.628	0.61
775	0.655	0.644	0.649	0.653	0.652
780	0.604	0.563	0.556	0.564	0.58
785	0.495	0.467	0.457	0.463	0.477

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.423	0.419	0.413	0.416	0.42
795	0.415	0.433	0.43	0.43	0.425
800	0.461	0.497	0.501	0.499	0.484
805	0.55	0.586	0.595	0.593	0.576
810	0.625	0.621	0.628	0.632	0.627
815	0.595	0.558	0.553	0.561	0.573
820	0.5	0.467	0.458	0.464	0.479
825	0.42	0.408	0.4	0.404	0.411
830	0.387	0.395	0.391	0.392	0.391
835	0.403	0.428	0.429	0.428	0.418
840	0.461	0.497	0.503	0.501	0.485
845	0.543	0.573	0.582	0.581	0.565
850	0.595	0.585	0.59	0.593	0.593
855	0.552	0.517	0.512	0.518	0.531
860	0.459	0.429	0.421	0.427	0.44
865	0.379	0.365	0.358	0.362	0.37
870	0.342	0.344	0.339	0.341	0.342
875	0.348	0.365	0.364	0.364	0.358
880	0.386	0.416	0.419	0.417	0.405
885	0.45	0.483	0.49	0.489	0.473
890	0.516	0.53	0.538	0.538	0.529
895	0.532	0.512	0.513	0.518	0.523
900	0.478	0.445	0.439	0.445	0.458
905	0.401	0.375	0.368	0.373	0.385
910	0.344	0.332	0.325	0.329	0.336
915	0.323	0.324	0.32	0.322	0.323
920	0.328	0.341	0.34	0.34	0.336
925	0.356	0.379	0.382	0.381	0.37
930	0.409	0.441	0.446	0.445	0.429
935	0.477	0.501	0.51	0.509	0.495
940	0.526	0.525	0.531	0.533	0.529
945	0.52	0.493	0.492	0.497	0.506
950	0.465	0.431	0.425	0.431	0.445

	OPTRONICS MODEL 736 RADIOMETER-TEXSTAR,INC.				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.470	0.473	0.472	0.464	0.476
455	0.522	0.525	0.514	0.508	0.523
460	0.491	0.495	0.504	0.495	0.506
465	0.534	0.537	0.519	0.513	0.533
470	0.537	0.541	0.552	0.540	0.552
475	0.530	0.532	0.526	0.518	0.535
480	0.595	0.597	0.590	0.581	0.599
485	0.555	0.558	0.571	0.558	0.571
490	0.600	0.600	0.583	0.576	0.600
495	0.623	0.625	0.632	0.620	0.637
500	0.586	0.588	0.594	0.581	0.599
505	0.646	0.647	0.625	0.619	0.645
510	0.646	0.649	0.660	0.646	0.663
515	0.604	0.606	0.611	0.599	0.617
520	0.667	0.669	0.647	0.640	0.666
525	0.668	0.669	0.684	0.668	0.686
530	0.613	0.615	0.625	0.612	0.628
535	0.671	0.672	0.646	0.639	0.666
540	0.694	0.694	0.701	0.688	0.707
545	0.623	0.623	0.646	0.629	0.643
550	0.650	0.651	0.632	0.624	0.647
555	0.718	0.716	0.704	0.692	0.717
560	0.661	0.660	0.691	0.671	0.685
565	0.617	0.617	0.621	0.607	0.625
570	0.690	0.689	0.660	0.653	0.681
575	0.710	0.708	0.717	0.701	0.722
580	0.622	0.621	0.654	0.634	0.647
585	0.617	0.617	0.608	0.599	0.620
590	0.705	0.704	0.672	0.666	0.696
595	0.708	0.707	0.722	0.706	0.725
600	0.613	0.613	0.649	0.628	0.641
605	0.603	0.603	0.595	0.584	0.607
610	0.699	0.699	0.665	0.658	0.684
615	0.718	0.716	0.729	0.711	0.728

	OPTRONICS MODEL 736 RADIOMETER-TEXSTAR,INC.				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.623	0.621	0.660	0.637	0.644
625	0.587	0.586	0.588	0.574	0.587
630	0.660	0.660	0.625	0.618	0.643
635	0.733	0.729	0.716	0.703	0.726
640	0.667	0.664	0.702	0.679	0.687
645	0.572	0.571	0.599	0.577	0.587
650	0.581	0.579	0.563	0.553	0.572
655	0.678	0.674	0.640	0.634	0.662
660	0.715	0.711	0.718	0.700	0.722
665	0.625	0.621	0.668	0.643	0.655
670	0.547	0.545	0.571	0.550	0.561
675	0.562	0.560	0.546	0.536	0.556
680	0.656	0.652	0.617	0.611	0.638
685	0.708	0.703	0.701	0.687	0.709
690	0.631	0.627	0.673	0.648	0.658
695	0.538	0.534	0.572	0.549	0.558
700	0.526	0.522	0.521	0.509	0.525
705	0.599	0.594	0.563	0.557	0.583
710	0.688	0.681	0.654	0.646	0.671
715	0.677	0.670	0.693	0.673	0.687
720	0.577	0.573	0.622	0.596	0.603
725	0.502	0.497	0.527	0.507	0.515
730	0.510	0.506	0.499	0.490	0.505
735	0.588	0.583	0.549	0.547	0.570
740	0.668	0.660	0.635	0.629	0.653
745	0.650	0.643	0.665	0.648	0.662
750	0.556	0.551	0.598	0.575	0.581
755	0.478	0.474	0.508	0.488	0.495
760	0.467	0.462	0.468	0.455	0.468
765	0.525	0.519	0.496	0.492	0.511
770	0.620	0.613	0.579	0.575	0.601
775	0.662	0.654	0.652	0.640	0.660
780	0.602	0.596	0.635	0.613	0.622
785	0.507	0.501	0.549	0.526	0.531

	OPTRONICS MODEL 736 RADIOMETER-TEXSTAR,INC.				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.448	0.445	0.472	0.454	0.460
795	0.448	0.445	0.445	0.436	0.447
800	0.504	0.500	0.478	0.473	0.491
805	0.590	0.587	0.552	0.549	0.570
810	0.638	0.632	0.623	0.615	0.632
815	0.596	0.591	0.624	0.605	0.613
820	0.509	0.503	0.552	0.528	0.529
825	0.441	0.435	0.470	0.453	0.455
830	0.417	0.413	0.426	0.415	0.421
835	0.439	0.437	0.427	0.419	0.431
840	0.505	0.501	0.473	0.469	0.486
845	0.579	0.575	0.543	0.541	0.559
850	0.606	0.600	0.598	0.587	0.600
855	0.552	0.548	0.581	0.563	0.568
860	0.464	0.458	0.503	0.483	0.485
865	0.393	0.389	0.422	0.404	0.408
870	0.365	0.361	0.377	0.365	0.370
875	0.381	0.378	0.372	0.367	0.375
880	0.426	0.423	0.399	0.398	0.411
885	0.491	0.487	0.454	0.454	0.471
890	0.543	0.537	0.513	0.511	0.528
895	0.537	0.530	0.539	0.526	0.539
900	0.472	0.465	0.502	0.484	0.487
905	0.400	0.393	0.433	0.414	0.417
910	0.355	0.349	0.379	0.363	0.366
915	0.342	0.338	0.352	0.341	0.346
920	0.356	0.351	0.350	0.343	0.353
925	0.393	0.389	0.371	0.368	0.382
930	0.453	0.447	0.416	0.416	0.433
935	0.513	0.507	0.476	0.475	0.495
940	0.544	0.537	0.527	0.520	0.538
945	0.524	0.515	0.538	0.522	0.533
950	0.464	0.457	0.500	0.479	0.483

	UV/VIS/NIR SPECTROPHOTOMETER - SIERRACIN/SYLMAR CORP.				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.474	0.472	0.472	0.473	0.473
455	0.490	0.497	0.497	0.495	0.495
460	0.459	0.459	0.459	0.460	0.460
465	0.545	0.548	0.548	0.547	0.547
470	0.472	0.477	0.477	0.476	0.475
475	0.551	0.549	0.549	0.551	0.551
480	0.543	0.551	0.551	0.549	0.548
485	0.517	0.517	0.518	0.518	0.519
490	0.619	0.621	0.621	0.621	0.621
495	0.553	0.560	0.560	0.559	0.559
500	0.574	0.572	0.573	0.573	0.573
505	0.652	0.656	0.656	0.655	0.655
510	0.572	0.578	0.578	0.576	0.577
515	0.598	0.596	0.597	0.597	0.598
520	0.680	0.684	0.684	0.683	0.683
525	0.591	0.598	0.598	0.596	0.596
530	0.600	0.599	0.599	0.599	0.600
535	0.699	0.701	0.701	0.701	0.700
540	0.619	0.627	0.628	0.626	0.626
545	0.587	0.587	0.588	0.588	0.589
550	0.693	0.690	0.690	0.691	0.691
555	0.677	0.686	0.686	0.684	0.684
560	0.580	0.585	0.585	0.584	0.584
565	0.630	0.625	0.626	0.626	0.627
570	0.721	0.723	0.723	0.722	0.722
575	0.627	0.636	0.637	0.633	0.634
580	0.569	0.569	0.570	0.569	0.570
585	0.658	0.653	0.654	0.656	0.656
590	0.722	0.727	0.727	0.727	0.727
595	0.611	0.619	0.620	0.616	0.618
600	0.559	0.559	0.561	0.560	0.561
605	0.649	0.644	0.644	0.645	0.646
610	0.728	0.732	0.732	0.731	0.731
615	0.626	0.636	0.637	0.633	0.634

	UV/VIS/NIR SPECTROPHOTOMETER - SIERRACIN/SYLMAR CORP.				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.551	0.553	0.554	0.553	0.554
625	0.605	0.599	0.600	0.600	0.602
630	0.717	0.715	0.715	0.716	0.716
635	0.675	0.684	0.685	0.682	0.683
640	0.559	0.564	0.566	0.562	0.564
645	0.537	0.535	0.536	0.534	0.537
650	0.630	0.623	0.625	0.625	0.626
655	0.717	0.718	0.719	0.718	0.719
660	0.633	0.642	0.643	0.639	0.641
665	0.531	0.535	0.536	0.533	0.535
670	0.525	0.522	0.523	0.522	0.524
675	0.616	0.609	0.611	0.611	0.614
680	0.704	0.704	0.704	0.704	0.705
685	0.634	0.643	0.645	0.641	0.642
690	0.525	0.531	0.532	0.529	0.530
695	0.495	0.493	0.496	0.493	0.495
700	0.557	0.549	0.551	0.551	0.552
705	0.665	0.659	0.660	0.661	0.662
710	0.675	0.679	0.680	0.677	0.679
715	0.567	0.574	0.577	0.572	0.574
720	0.485	0.487	0.489	0.485	0.487
725	0.479	0.476	0.478	0.475	0.478
730	0.550	0.543	0.545	0.544	0.546
735	0.649	0.644	0.644	0.644	0.646
740	0.649	0.653	0.655	0.651	0.653
745	0.544	0.551	0.553	0.548	0.550
750	0.460	0.462	0.464	0.460	0.463
755	0.441	0.438	0.440	0.438	0.441
760	0.492	0.487	0.488	0.488	0.490
765	0.593	0.585	0.587	0.587	0.589
770	0.652	0.651	0.654	0.651	0.653
775	0.592	0.599	0.601	0.597	0.599
780	0.490	0.496	0.498	0.493	0.495
785	0.429	0.429	0.431	0.429	0.431

	UV/VIS/NIR SPECTROPHOTOMETER - SIERRACIN/SYLMAR CORP.				
			SAMPLE 3		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.424	0.422	0.424	0.421	0.424
795	0.477	0.470	0.473	0.472	0.474
800	0.568	0.560	0.562	0.561	0.563
805	0.627	0.624	0.626	0.623	0.625
810	0.583	0.588	0.591	0.586	0.588
815	0.488	0.494	0.497	0.492	0.494
820	0.418	0.421	0.423	0.418	0.421
825	0.394	0.393	0.395	0.394	0.395
830	0.418	0.414	0.416	0.413	0.416
835	0.484	0.476	0.479	0.477	0.479
840	0.565	0.558	0.561	0.559	0.560
845	0.597	0.595	0.597	0.595	0.596
850	0.541	0.550	0.551	0.544	0.547
855	0.451	0.661	0.458	0.457	0.458
860	0.385	0.386	0.389	0.384	0.386
865	0.347	0.353	0.352	0.347	0.348
870	0.353	0.356	0.357	0.355	0.355
875	0.394	0.396	0.397	0.347	0.400
880	0.465	0.467	0.470	0.468	0.468
885	0.530	0.527	0.530	0.526	0.526
890	0.524	0.528	0.531	0.524	0.524
895	0.461	0.471	0.471	0.463	0.462
900	0.387	0.395	0.392	0.386	0.389
905	0.334	0.343	0.343	0.336	0.336
910	0.317	0.317	0.320	0.318	0.317
915	0.328	0.329	0.331	0.332	0.332
920	0.374	0.370	0.373	0.371	0.370
925	0.429	0.427	0.430	0.429	0.429
930	0.496	0.489	0.490	0.495	0.493
935	0.530	0.531	0.532	0.526	0.526
940	0.503	0.511	0.510	0.501	0.502
945	0.436	0.443	0.442	0.439	0.440
950	0.382	0.384	0.384	0.378	0.380

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.835	0.838	0.847	0.852	0.826
455	0.841	0.836	0.844	0.842	0.824
460	0.834	0.838	0.847	0.849	0.828
465	0.840	0.843	0.849	0.856	0.840
470	0.844	0.845	0.846	0.854	0.826
475	0.838	0.840	0.841	0.846	0.835
480	0.843	0.839	0.844	0.848	0.827
485	0.842	0.847	0.841	0.854	0.826
490	0.842	0.847	0.842	0.851	0.829
495	0.833	0.838	0.845	0.846	0.830
500	0.843	0.838	0.842	0.847	0.832
505	0.836	0.838	0.843	0.855	0.833
510	0.838	0.840	0.841	0.847	0.827
515	0.842	0.837	0.842	0.850	0.829
520	0.835	0.838	0.844	0.841	0.835
525	0.836	0.840	0.838	0.847	0.839
530	0.836	0.835	0.842	0.844	0.831
535	0.838	0.833	0.839	0.841	0.831
540	0.828	0.835	0.836	0.838	0.828
545	0.828	0.828	0.834	0.842	0.827
550	0.832	0.831	0.832	0.837	0.816
555	0.828	0.832	0.832	0.842	0.818
560	0.828	0.828	0.830	0.836	0.827
565	0.828	0.828	0.833	0.841	0.822
570	0.824	0.830	0.832	0.836	0.822
575	0.825	0.825	0.834	0.835	0.816
580	0.825	0.824	0.830	0.835	0.822
585	0.828	0.830	0.828	0.838	0.819
590	0.824	0.831	0.829	0.835	0.826
595	0.829	0.832	0.832	0.839	0.823
600	0.830	0.833	0.833	0.840	0.824
605	0.832	0.835	0.836	0.840	0.830
610	0.836	0.838	0.839	0.847	0.835
615	0.838	0.841	0.841	0.849	0.831

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.839	0.838	0.843	0.849	0.838
625	0.838	0.840	0.844	0.849	0.834
630	0.841	0.843	0.845	0.849	0.835
635	0.842	0.844	0.845	0.852	0.830
640	0.845	0.847	0.849	0.856	0.838
645	0.849	0.854	0.853	0.857	0.842
650	0.852	0.856	0.859	0.863	0.843
655	0.857	0.859	0.860	0.867	0.847
660	0.862	0.862	0.862	0.871	0.856
665	0.867	0.870	0.871	0.877	0.859
670	0.869	0.872	0.870	0.874	0.856
675	0.874	0.868	0.873	0.880	0.865
680	0.870	0.874	0.877	0.879	0.864
685	0.877	0.869	0.875	0.879	0.862
690	0.873	0.879	0.883	0.885	0.868
695	0.880	0.875	0.877	0.887	0.867
700	0.877	0.879	0.882	0.884	0.875
705	0.876	0.882	0.882	0.888	0.875
710	0.883	0.880	0.881	0.888	0.877
715	0.879	0.883	0.883	0.891	0.883
720	0.882	0.880	0.882	0.891	0.882
725	0.881	0.878	0.881	0.892	0.875
730	0.883	0.883	0.885	0.892	0.879
735	0.879	0.882	0.883	0.891	0.875
740	0.883	0.883	0.884	0.889	0.878
745	0.884	0.885	0.885	0.895	0.879
750	0.884	0.883	0.887	0.889	0.885
755	0.885	0.886	0.886	0.888	0.883
760	0.885	0.884	0.889	0.891	0.878
765	0.887	0.884	0.890	0.896	0.885
770	0.886	0.887	0.893	0.891	0.894
775	0.886	0.881	0.888	0.892	0.894
780	0.886	0.890	0.886	0.892	0.889
785	0.885	0.885	0.889	0.897	0.891

	EG&G RADOMA SPECTRARADIOMETER - ARMSTRONG LAB (HECV)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.890	0.887	0.890	0.895	0.882
795	0.886	0.888	0.892	0.891	0.881
800	0.886	0.886	0.887	0.896	0.894
805	0.888	0.890	0.886	0.892	0.886
810	0.892	0.883	0.891	0.893	0.900
815	0.893	0.888	0.891	0.898	0.896
820	0.897	0.893	0.886	0.894	0.895
825	0.891	0.885	0.885	0.899	0.898
830	0.886	0.886	0.890	0.896	0.903
835	0.888	0.886	0.885	0.890	0.900
840	0.887	0.893	0.884	0.892	0.906
845	0.889	0.884	0.889	0.900	0.894
850	0.885	0.884	0.891	0.892	0.885
855	0.879	0.885	0.880	0.889	0.888
860	0.885	0.879	0.883	0.886	0.888
865	0.877	0.874	0.885	0.877	0.870
870	0.875	0.878	0.878	0.885	0.879
875	0.883	0.889	0.883	0.902	0.878
880	0.886	0.887	0.889	0.893	0.882
885	0.881	0.885	0.890	0.892	0.875
890	0.884	0.889	0.883	0.896	0.882
895	0.884	0.884	0.877	0.880	0.878
900	0.879	0.880	0.876	0.894	0.871
905	0.878	0.880	0.867	0.881	0.863
910	0.878	0.884	0.877	0.892	0.865
915	0.877	0.880	0.887	0.899	0.883
920	0.886	0.876	0.882	0.895	0.872
925	0.888	0.887	0.896	0.894	0.882
930	0.899	0.894	0.879	0.881	0.890
935	0.892	0.895	0.887	0.896	0.868
940	0.870	0.903	0.893	0.907	0.898
945	0.875	0.895	0.899	0.895	0.894
950	0.894	0.890	0.882	0.896	0.845

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.823	0.824	0.821	0.819	0.817
455	0.823	0.827	0.824	0.822	0.821
460	0.827	0.829	0.826	0.823	0.823
465	0.829	0.830	0.829	0.825	0.825
470	0.829	0.832	0.829	0.827	0.826
475	0.831	0.833	0.831	0.829	0.828
480	0.832	0.834	0.833	0.830	0.829
485	0.833	0.835	0.833	0.830	0.830
490	0.833	0.835	0.833	0.831	0.830
495	0.834	0.835	0.834	0.831	0.831
500	0.834	0.836	0.833	0.831	0.830
505	0.833	0.836	0.833	0.832	0.830
510	0.834	0.835	0.833	0.832	0.830
515	0.833	0.835	0.834	0.832	0.830
520	0.832	0.835	0.833	0.831	0.830
525	0.832	0.833	0.832	0.830	0.829
530	0.830	0.832	0.831	0.829	0.828
535	0.829	0.831	0.829	0.828	0.827
540	0.829	0.830	0.828	0.826	0.825
545	0.827	0.830	0.827	0.825	0.824
550	0.827	0.828	0.826	0.825	0.823
555	0.826	0.828	0.826	0.824	0.824
560	0.825	0.829	0.826	0.825	0.823
565	0.826	0.828	0.825	0.823	0.822
570	0.824	0.826	0.824	0.822	0.821
575	0.823	0.824	0.823	0.821	0.820
580	0.823	0.823	0.821	0.820	0.819
585	0.822	0.824	0.823	0.819	0.820
590	0.823	0.825	0.824	0.822	0.821
595	0.826	0.828	0.825	0.824	0.823
600	0.829	0.831	0.829	0.827	0.827
605	0.832	0.834	0.832	0.830	0.829
610	0.835	0.836	0.834	0.832	0.832
615	0.836	0.837	0.836	0.835	0.833

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.837	0.839	0.837	0.835	0.835
625	0.837	0.839	0.837	0.836	0.835
630	0.839	0.840	0.838	0.836	0.836
635	0.841	0.842	0.839	0.838	0.838
640	0.844	0.845	0.844	0.842	0.841
645	0.848	0.851	0.849	0.847	0.845
650	0.854	0.856	0.854	0.852	0.852
655	0.859	0.861	0.859	0.858	0.857
660	0.864	0.867	0.864	0.862	0.862
665	0.868	0.869	0.869	0.866	0.866
670	0.871	0.872	0.870	0.870	0.868
675	0.874	0.874	0.874	0.872	0.872
680	0.876	0.877	0.875	0.875	0.873
685	0.878	0.879	0.878	0.877	0.876
690	0.879	0.881	0.880	0.878	0.876
695	0.880	0.883	0.881	0.879	0.879
700	0.881	0.883	0.882	0.880	0.880
705	0.882	0.884	0.881	0.881	0.880
710	0.882	0.885	0.882	0.880	0.880
715	0.883	0.885	0.883	0.882	0.882
720	0.883	0.885	0.885	0.883	0.882
725	0.884	0.887	0.885	0.883	0.883
730	0.884	0.886	0.885	0.883	0.884
735	0.884	0.886	0.885	0.884	0.881
740	0.884	0.886	0.884	0.883	0.882
745	0.884	0.887	0.884	0.883	0.883
750	0.886	0.887	0.885	0.885	0.884
755	0.885	0.887	0.885	0.885	0.883
760	0.886	0.887	0.887	0.885	0.885
765	0.886	0.887	0.886	0.885	0.885
770	0.886	0.889	0.886	0.885	0.885
775	0.887	0.887	0.885	0.885	0.884
780	0.886	0.888	0.887	0.886	0.884
785	0.887	0.888	0.887	0.885	0.883

	CARY 5G SPECTRAPHOTOMETER - BROOKS, AFB (AL/OEO)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.887	0.889	0.886	0.884	0.885
795	0.887	0.888	0.887	0.885	0.886
800	0.889	0.888	0.887	0.887	0.885
805	0.888	0.889	0.887	0.886	0.886
810	0.888	0.888	0.886	0.886	0.886
815	0.887	0.890	0.889	0.888	0.884
820	0.888	0.891	0.887	0.887	0.885
825	0.887	0.890	0.886	0.887	0.887
830	0.890	0.889	0.889	0.888	0.887
835	0.885	0.888	0.888	0.886	0.886
840	0.888	0.889	0.887	0.889	0.885
845	0.886	0.887	0.888	0.887	0.888
850	0.888	0.889	0.887	0.886	0.883
855	0.886	0.890	0.888	0.881	0.884
860	0.878	0.884	0.875	0.878	0.879
865	0.879	0.874	0.871	0.871	0.872
870	0.875	0.873	0.869	0.878	0.878
875	0.883	0.883	0.881	0.879	0.880
880	0.886	0.887	0.885	0.883	0.884
885	0.887	0.887	0.887	0.885	0.885
890	0.887	0.886	0.886	0.885	0.885
895	0.885	0.885	0.883	0.883	0.884
900	0.882	0.882	0.880	0.880	0.879
905	0.879	0.879	0.876	0.877	0.877
910	0.877	0.877	0.877	0.875	0.876
915	0.882	0.883	0.881	0.881	0.881
920	0.888	0.889	0.887	0.886	0.885
925	0.889	0.890	0.889	0.888	0.888
930	0.890	0.890	0.889	0.887	0.888
935	0.890	0.890	0.890	0.888	0.888
940	0.891	0.891	0.889	0.888	0.888
945	0.891	0.892	0.890	0.889	0.888
950	0.891	0.890	0.890	0.888	0.888

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.818	0.818	0.814	0.816	0.808
455	0.820	0.820	0.817	0.818	0.810
460	0.822	0.822	0.819	0.820	0.813
465	0.824	0.824	0.820	0.822	0.814
470	0.826	0.826	0.822	0.824	0.816
475	0.827	0.827	0.823	0.825	0.817
480	0.829	0.829	0.825	0.826	0.818
485	0.829	0.829	0.825	0.827	0.819
490	0.830	0.830	0.826	0.828	0.820
495	0.831	0.830	0.827	0.828	0.821
500	0.831	0.831	0.827	0.829	0.821
505	0.831	0.831	0.827	0.829	0.821
510	0.831	0.830	0.827	0.828	0.821
515	0.831	0.830	0.826	0.828	0.820
520	0.830	0.829	0.825	0.827	0.819
525	0.829	0.828	0.824	0.826	0.819
530	0.828	0.826	0.823	0.825	0.817
535	0.826	0.825	0.822	0.823	0.816
540	0.825	0.824	0.820	0.822	0.815
545	0.824	0.823	0.819	0.821	0.814
550	0.823	0.823	0.819	0.821	0.814
555	0.824	0.823	0.819	0.821	0.813
560	0.823	0.822	0.819	0.820	0.813
565	0.822	0.821	0.818	0.820	0.812
570	0.821	0.821	0.817	0.819	0.812
575	0.820	0.819	0.816	0.818	0.811
580	0.819	0.819	0.815	0.817	0.810
585	0.820	0.819	0.816	0.817	0.810
590	0.821	0.821	0.817	0.819	0.812
595	0.824	0.824	0.820	0.822	0.815
600	0.828	0.827	0.823	0.825	0.818
605	0.831	0.830	0.826	0.828	0.822
610	0.833	0.833	0.829	0.831	0.824
615	0.835	0.834	0.831	0.833	0.826

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.836	0.836	0.832	0.833	0.827
625	0.836	0.836	0.833	0.834	0.827
630	0.837	0.837	0.833	0.835	0.828
635	0.839	0.838	0.835	0.837	0.830
640	0.843	0.842	0.839	0.840	0.834
645	0.847	0.846	0.844	0.845	0.838
650	0.853	0.852	0.849	0.850	0.844
655	0.858	0.857	0.854	0.855	0.849
660	0.862	0.862	0.858	0.860	0.854
665	0.866	0.865	0.862	0.863	0.857
670	0.869	0.868	0.865	0.867	0.860
675	0.871	0.870	0.867	0.869	0.862
680	0.874	0.873	0.869	0.871	0.864
685	0.875	0.875	0.871	0.873	0.867
690	0.877	0.877	0.873	0.875	0.868
695	0.878	0.878	0.874	0.876	0.869
700	0.879	0.878	0.875	0.876	0.871
705	0.880	0.878	0.875	0.877	0.871
710	0.879	0.879	0.875	0.877	0.871
715	0.881	0.880	0.877	0.878	0.872
720	0.882	0.881	0.878	0.879	0.873
725	0.883	0.881	0.878	0.880	0.873
730	0.882	0.881	0.879	0.880	0.874
735	0.883	0.882	0.879	0.880	0.874
740	0.883	0.882	0.878	0.880	0.874
745	0.882	0.882	0.880	0.880	0.874
750	0.884	0.883	0.880	0.881	0.875
755	0.885	0.883	0.880	0.882	0.876
760	0.885	0.884	0.881	0.883	0.877
765	0.886	0.885	0.881	0.882	0.876
770	0.886	0.884	0.881	0.883	0.876
775	0.886	0.885	0.881	0.882	0.876
780	0.886	0.885	0.882	0.883	0.877
785	0.886	0.885	0.882	0.883	0.878

	PERKIN ELMER LAMBDA 9 - BROOKS, AFB (AL/OEO)				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.887	0.886	0.882	0.883	0.878
795	0.886	0.886	0.882	0.883	0.878
800	0.887	0.886	0.883	0.884	0.878
805	0.887	0.886	0.883	0.885	0.878
810	0.887	0.886	0.884	0.885	0.879
815	0.887	0.887	0.884	0.885	0.879
820	0.888	0.887	0.884	0.885	0.879
825	0.887	0.888	0.885	0.886	0.880
830	0.888	0.888	0.886	0.886	0.882
835	0.889	0.890	0.889	0.888	0.883
840	0.889	0.892	0.890	0.891	0.886
845	0.889	0.895	0.893	0.892	0.889
850	0.890	0.894	0.894	0.894	0.891
855	0.885	0.892	0.893	0.891	0.889
860	0.880	0.884	0.885	0.886	0.880
865	0.875	0.841	0.823	0.836	0.808
870	0.872	0.839	0.820	0.835	0.806
875	0.876	0.842	0.823	0.838	0.809
880	0.880	0.847	0.827	0.843	0.813
885	0.883	0.849	0.830	0.845	0.817
890	0.885	0.850	0.831	0.846	0.816
895	0.883	0.849	0.830	0.845	0.815
900	0.881	0.847	0.828	0.843	0.814
905	0.878	0.844	0.825	0.840	0.811
910	0.875	0.842	0.824	0.838	0.809
915	0.879	0.846	0.827	0.842	0.813
920	0.886	0.851	0.832	0.847	0.818
925	0.888	0.853	0.835	0.849	0.821
930	0.889	0.854	0.836	0.851	0.822
935	0.888	0.855	0.837	0.851	0.822
940	0.889	0.856	0.838	0.852	0.823
945	0.890	0.856	0.838	0.852	0.823
950	0.890	0.856	0.838	0.852	0.824

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.821	0.817	0.819	0.82	0.824
455	0.824	0.819	0.821	0.823	0.825
460	0.826	0.821	0.824	0.824	0.828
465	0.828	0.823	0.825	0.826	0.829
470	0.829	0.824	0.827	0.828	0.831
475	0.83	0.826	0.828	0.829	0.832
480	0.832	0.827	0.829	0.83	0.833
485	0.833	0.828	0.83	0.832	0.834
490	0.833	0.829	0.831	0.832	0.834
495	0.834	0.829	0.832	0.832	0.835
500	0.834	0.829	0.832	0.832	0.835
505	0.834	0.829	0.832	0.832	0.835
510	0.834	0.829	0.832	0.832	0.835
515	0.834	0.828	0.831	0.832	0.834
520	0.833	0.828	0.83	0.831	0.834
525	0.832	0.826	0.829	0.83	0.832
530	0.832	0.825	0.828	0.829	0.832
535	0.829	0.824	0.826	0.827	0.829
540	0.828	0.823	0.825	0.826	0.829
545	0.828	0.821	0.825	0.825	0.827
550	0.827	0.821	0.824	0.824	0.826
555	0.826	0.821	0.824	0.825	0.827
560	0.826	0.821	0.824	0.824	0.826
565	0.826	0.821	0.823	0.824	0.826
570	0.825	0.819	0.821	0.823	0.825
575	0.824	0.817	0.821	0.821	0.824
580	0.824	0.817	0.821	0.821	0.824
585	0.824	0.818	0.821	0.821	0.824
590	0.826	0.82	0.822	0.823	0.825
595	0.829	0.823	0.825	0.825	0.828
600	0.832	0.825	0.829	0.829	0.832
605	0.835	0.829	0.832	0.833	0.834
610	0.838	0.832	0.835	0.835	0.836
615	0.839	0.833	0.836	0.836	0.838

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.84	0.834	0.836	0.838	0.839
625	0.84	0.834	0.837	0.838	0.839
630	0.841	0.835	0.838	0.838	0.84
635	0.843	0.837	0.839	0.84	0.842
640	0.846	0.84	0.843	0.844	0.846
645	0.851	0.845	0.848	0.848	0.85
650	0.856	0.85	0.853	0.854	0.855
655	0.861	0.855	0.858	0.859	0.861
660	0.866	0.86	0.863	0.863	0.865
665	0.869	0.864	0.866	0.866	0.869
670	0.872	0.866	0.869	0.869	0.872
675	0.875	0.869	0.872	0.872	0.874
680	0.876	0.872	0.874	0.874	0.875
685	0.879	0.873	0.876	0.876	0.877
690	0.88	0.875	0.877	0.877	0.879
695	0.882	0.876	0.879	0.879	0.88
700	0.882	0.877	0.879	0.88	0.881
705	0.882	0.877	0.88	0.88	0.881
710	0.883	0.878	0.88	0.881	0.882
715	0.884	0.879	0.882	0.882	0.884
720	0.885	0.88	0.883	0.883	0.885
725	0.886	0.881	0.883	0.883	0.885
730	0.886	0.881	0.884	0.884	0.885
735	0.886	0.881	0.883	0.883	0.885
740	0.886	0.882	0.884	0.884	0.886
745	0.886	0.882	0.884	0.883	0.885
750	0.887	0.883	0.885	0.885	0.886
755	0.888	0.883	0.886	0.886	0.887
760	0.888	0.883	0.886	0.886	0.887
765	0.888	0.884	0.887	0.887	0.888
770	0.889	0.884	0.887	0.887	0.889
775	0.889	0.885	0.887	0.887	0.889
780	0.889	0.885	0.887	0.887	0.889
785	0.89	0.885	0.887	0.888	0.889

	HITACHI U-2000 - POLYCAST TECHNOLOGY CORPORATION				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.89	0.885	0.888	0.888	0.889
795	0.89	0.885	0.888	0.888	0.89
800	0.89	0.885	0.888	0.887	0.889
805	0.89	0.886	0.888	0.888	0.89
810	0.89	0.886	0.889	0.889	0.89
815	0.891	0.886	0.889	0.888	0.89
820	0.891	0.887	0.889	0.889	0.891
825	0.891	0.887	0.889	0.889	0.891
830	0.891	0.887	0.89	0.889	0.891
835	0.891	0.887	0.889	0.889	0.891
840	0.891	0.887	0.889	0.889	0.891
845	0.89	0.886	0.889	0.889	0.89
850	0.889	0.885	0.888	0.887	0.889
855	0.887	0.883	0.885	0.885	0.887
860	0.883	0.879	0.881	0.882	0.883
865	0.877	0.874	0.876	0.876	0.877
870	0.877	0.873	0.876	0.876	0.877
875	0.883	0.878	0.882	0.881	0.883
880	0.887	0.883	0.886	0.885	0.887
885	0.889	0.885	0.888	0.888	0.89
890	0.89	0.885	0.888	0.888	0.889
895	0.889	0.883	0.887	0.887	0.889
900	0.89	0.88	0.884	0.884	0.885
905	0.889	0.877	0.881	0.88	0.882
910	0.881	0.876	0.879	0.879	0.881
915	0.887	0.881	0.886	0.885	0.887
920	0.892	0.886	0.89	0.889	0.892
925	0.894	0.888	0.892	0.892	0.893
930	0.895	0.888	0.893	0.892	0.894
935	0.896	0.889	0.893	0.893	0.895
940	0.896	0.889	0.893	0.893	0.895
945	0.896	0.889	0.893	0.893	0.895
950	0.896	0.89	0.893	0.893	0.895

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR, INC.				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.844	0.832	0.840	0.815	0.826
455	0.852	0.836	0.847	0.821	0.829
460	0.857	0.841	0.861	0.835	0.839
465	0.866	0.836	0.853	0.830	0.837
470	0.851	0.844	0.854	0.830	0.837
475	0.851	0.844	0.856	0.828	0.839
480	0.863	0.843	0.854	0.832	0.842
485	0.882	0.843	0.856	0.833	0.852
490	0.862	0.842	0.856	0.833	0.853
495	0.865	0.844	0.855	0.831	0.844
500	0.868	0.846	0.855	0.831	0.840
505	0.863	0.844	0.853	0.829	0.838
510	0.862	0.844	0.854	0.829	0.841
515	0.861	0.844	0.853	0.829	0.842
520	0.859	0.841	0.852	0.827	0.842
525	0.862	0.838	0.849	0.826	0.839
530	0.861	0.837	0.847	0.824	0.839
535	0.860	0.833	0.847	0.821	0.837
540	0.862	0.831	0.844	0.821	0.835
545	0.857	0.830	0.841	0.819	0.834
550	0.851	0.831	0.843	0.820	0.836
555	0.852	0.828	0.841	0.819	0.835
560	0.860	0.829	0.840	0.819	0.835
565	0.852	0.829	0.841	0.818	0.836
570	0.845	0.826	0.837	0.815	0.834
575	0.846	0.826	0.836	0.815	0.833
580	0.846	0.823	0.835	0.812	0.834
585	0.842	0.824	0.834	0.813	0.834
590	0.833	0.825	0.835	0.816	0.834
595	0.850	0.827	0.838	0.818	0.838
600	0.857	0.832	0.841	0.822	0.842
605	0.862	0.834	0.843	0.825	0.844
610	0.846	0.836	0.844	0.827	0.845
615	0.853	0.839	0.848	0.830	0.850

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR, INC.				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.858	0.842	0.851	0.833	0.853
625	0.857	0.842	0.851	0.834	0.854
630	0.857	0.842	0.853	0.835	0.856
635	0.857	0.846	0.856	0.838	0.858
640	0.862	0.847	0.857	0.841	0.861
645	0.864	0.852	0.861	0.844	0.863
650	0.869	0.857	0.865	0.850	0.868
655	0.874	0.864	0.871	0.856	0.874
660	0.879	0.867	0.875	0.861	0.878
665	0.891	0.871	0.880	0.865	0.882
670	0.887	0.874	0.883	0.869	0.886
675	0.888	0.876	0.886	0.871	0.889
680	0.893	0.877	0.888	0.873	0.892
685	0.894	0.878	0.889	0.875	0.894
690	0.888	0.882	0.892	0.878	0.895
695	0.892	0.883	0.894	0.879	0.894
700	0.891	0.884	0.892	0.880	0.893
705	0.899	0.884	0.892	0.880	0.894
710	0.897	0.885	0.893	0.881	0.892
715	0.903	0.887	0.895	0.883	0.894
720	0.901	0.888	0.896	0.885	0.896
725	0.900	0.888	0.894	0.883	0.893
730	0.895	0.892	0.897	0.886	0.893
735	0.901	0.890	0.895	0.885	0.893
740	0.905	0.889	0.895	0.883	0.893
745	0.905	0.890	0.896	0.883	0.893
750	0.897	0.893	0.896	0.886	0.895
755	0.908	0.891	0.897	0.885	0.894
760	0.903	0.892	0.899	0.887	0.894
765	0.903	0.895	0.899	0.888	0.895
770	0.905	0.893	0.900	0.887	0.896
775	0.912	0.894	0.900	0.888	0.896
780	0.910	0.894	0.900	0.889	0.895
785	0.908	0.895	0.900	0.890	0.896

	OPTRONICS MODEL 736 RADIOMETER - TEXSTAR, INC.				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.911	0.895	0.900	0.889	0.896
795	0.906	0.897	0.900	0.891	0.897
800	0.905	0.896	0.901	0.891	0.899
805	0.907	0.896	0.902	0.891	0.899
810	0.910	0.897	0.901	0.892	0.897
815	0.911	0.896	0.900	0.891	0.897
820	0.912	0.898	0.901	0.892	0.898
825	0.903	0.896	0.902	0.892	0.898
830	0.905	0.896	0.900	0.891	0.900
835	0.907	0.893	0.899	0.889	0.898
840	0.902	0.893	0.900	0.891	0.900
845	0.902	0.892	0.899	0.890	0.898
850	0.907	0.891	0.896	0.888	0.895
855	0.902	0.888	0.893	0.884	0.892
860	0.899	0.884	0.889	0.881	0.888
865	0.897	0.877	0.883	0.874	0.883
870	0.892	0.876	0.882	0.873	0.882
875	0.894	0.883	0.888	0.878	0.888
880	0.898	0.888	0.891	0.883	0.892
885	0.905	0.892	0.894	0.886	0.896
890	0.904	0.892	0.895	0.886	0.896
895	0.907	0.888	0.891	0.882	0.893
900	0.911	0.882	0.887	0.878	0.889
905	0.898	0.878	0.879	0.871	0.884
910	0.896	0.881	0.880	0.873	0.886
915	0.906	0.884	0.888	0.880	0.891
920	0.919	0.890	0.892	0.885	0.896
925	0.911	0.894	0.894	0.888	0.899
930	0.922	0.895	0.897	0.889	0.900
935	0.930	0.895	0.897	0.887	0.900
940	0.931	0.894	0.894	0.888	0.899
945	0.920	0.896	0.897	0.891	0.902
950	0.922	0.897	0.899	0.892	0.903

	UV/VIS/NIR SPECTROPHOTOMETER-SIERRACIN/SYLMAR CORP.				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
450	0.797	0.799	0.798	0.798	0.800
455	0.800	0.802	0.801	0.801	0.802
460	0.803	0.805	0.804	0.804	0.805
465	0.805	0.808	0.806	0.805	0.807
470	0.807	0.810	0.809	0.807	0.808
475	0.808	0.811	0.809	0.809	0.810
480	0.810	0.813	0.811	0.810	0.811
485	0.811	0.814	0.812	0.812	0.814
490	0.813	0.815	0.813	0.814	0.814
495	0.813	0.816	0.814	0.814	0.816
500	0.814	0.817	0.815	0.814	0.815
505	0.815	0.817	0.815	0.814	0.815
510	0.814	0.817	0.815	0.815	0.815
515	0.815	0.817	0.815	0.814	0.815
520	0.814	0.816	0.815	0.814	0.815
525	0.814	0.816	0.813	0.813	0.815
530	0.813	0.814	0.813	0.812	0.813
535	0.811	0.814	0.812	0.811	0.813
540	0.810	0.812	0.810	0.810	0.811
545	0.810	0.811	0.810	0.809	0.811
550	0.809	0.811	0.810	0.810	0.811
555	0.809	0.812	0.809	0.809	0.811
560	0.809	0.811	0.810	0.808	0.810
565	0.808	0.811	0.809	0.809	0.809
570	0.807	0.810	0.808	0.808	0.809
575	0.806	0.809	0.807	0.807	0.808
580	0.807	0.808	0.806	0.806	0.808
585	0.807	0.809	0.808	0.808	0.808
590	0.808	0.810	0.809	0.809	0.811
595	0.812	0.814	0.812	0.812	0.813
600	0.815	0.817	0.815	0.815	0.817
605	0.818	0.820	0.819	0.819	0.820
610	0.821	0.823	0.822	0.822	0.823
615	0.824	0.825	0.823	0.823	0.825

	UV/VIS/NIR SPECTROPHOTOMETER-SIERRACIN/SYLMAR CORP.				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
620	0.824	0.826	0.824	0.824	0.826
625	0.824	0.826	0.825	0.824	0.826
630	0.825	0.827	0.826	0.825	0.827
635	0.828	0.830	0.828	0.828	0.829
640	0.831	0.833	0.832	0.831	0.832
645	0.837	0.838	0.837	0.836	0.838
650	0.841	0.844	0.842	0.842	0.843
655	0.846	0.849	0.847	0.847	0.848
660	0.851	0.853	0.852	0.851	0.853
665	0.855	0.858	0.855	0.856	0.857
670	0.857	0.860	0.858	0.858	0.858
675	0.860	0.862	0.861	0.861	0.862
680	0.863	0.865	0.863	0.862	0.864
685	0.865	0.867	0.866	0.865	0.866
690	0.866	0.869	0.866	0.867	0.868
695	0.869	0.870	0.869	0.868	0.869
700	0.869	0.871	0.869	0.869	0.870
705	0.869	0.871	0.870	0.869	0.871
710	0.870	0.872	0.870	0.870	0.871
715	0.871	0.873	0.872	0.872	0.873
720	0.872	0.875	0.873	0.872	0.874
725	0.873	0.875	0.873	0.873	0.874
730	0.875	0.876	0.874	0.873	0.875
735	0.873	0.875	0.874	0.874	0.874
740	0.874	0.876	0.874	0.874	0.875
745	0.874	0.877	0.875	0.874	0.875
750	0.874	0.878	0.875	0.875	0.876
755	0.875	0.878	0.875	0.876	0.877
760	0.876	0.878	0.877	0.876	0.878
765	0.877	0.879	0.878	0.877	0.879
770	0.877	0.881	0.878	0.878	0.879
775	0.877	0.879	0.877	0.878	0.878
780	0.878	0.880	0.877	0.877	0.878
785	0.879	0.880	0.879	0.879	0.880

	UV/VIS/NIR SPECTROPHOTOMETER-SIERRACIN/SYLMAR CORP.				
			SAMPLE 4		
wavelength	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Rep. 5
(nm)	(trans.)	(trans.)	(trans.)	(trans.)	(trans.)
790	0.878	0.882	0.879	0.878	0.879
795	0.878	0.880	0.878	0.879	0.880
800	0.878	0.882	0.879	0.879	0.880
805	0.878	0.882	0.879	0.879	0.879
810	0.879	0.882	0.879	0.878	0.879
815	0.879	0.882	0.880	0.881	0.881
820	0.880	0.882	0.881	0.879	0.881
825	0.879	0.882	0.880	0.880	0.882
830	0.880	0.885	0.883	0.879	0.881
835	0.882	0.884	0.883	0.880	0.881
840	0.880	0.885	0.881	0.879	0.882
845	0.879	0.879	0.880	0.880	0.882
850	0.884	0.884	0.879	0.878	0.882
855	0.877	0.880	0.878	0.875	0.879
860	0.870	0.876	0.873	0.872	0.876
865	0.873	0.880	0.875	0.864	0.866
870	0.873	0.884	0.876	0.864	0.866
875	0.869	0.872	0.870	0.868	0.869
880	0.879	0.882	0.883	0.874	0.877
885	0.880	0.889	0.887	0.878	0.879
890	0.883	0.886	0.882	0.875	0.876
895	0.877	0.883	0.883	0.875	0.876
900	0.883	0.880	0.879	0.872	0.873
905	0.883	0.882	0.879	0.867	0.870
910	0.869	0.879	0.877	0.867	0.870
915	0.870	0.884	0.875	0.874	0.876
920	0.879	0.891	0.888	0.878	0.880
925	0.889	0.895	0.890	0.879	0.881
930	0.879	0.885	0.880	0.881	0.881
935	0.888	0.893	0.893	0.883	0.883
940	0.890	0.893	0.889	0.881	0.883
945	0.877	0.888	0.882	0.881	0.883
950	0.888	0.895	0.893	0.885	0.884